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Illumination of Outdoor Sports

Modern Methods Employed for Lighting Tennis Courts, Clock Golf Courses, Motorcycle and Bicycle Racing, Arenas, Bathing Beaches, Trap-Shooting Ranges and Other Outdoor Pastimes

By R. E. HARRINGTON

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A few years ago it was not practicable to indulge extensively in evening sports on account of the lack of suitable means of artificial illumination. But the development of type C lamps and suitable accessories has made it entirely feasible to enjoy outdoor sports at night.

The conditions to be met in such lighting present problems not encountered in other fields of illumination. In the office, for instance, the desk level is usually assumed to be the working plane, and all illumination calculations may be made with this plane as the basis. In the case of a tennis court, for example, this condition is materially changed. There is no fixed plane and the light must be distributed in such a manner that the ball is well lighted during its entire travel.

There are several conditions to be met in order to secure a well-lighted tennis court. The entire surface of the court must be lighted evenly to a high intensity. An evenly lighted court is necessary because the ball apparently changes its speed when passing through sections that vary in intensity. A fairly high intensity is essential, the game being played rapidly and requiring sufficient light to allow the player to follow the ball readily.

The glare from light sources in the direct line of vision must be avoided. If, when following the ball after a stroke, one is forced to look at a lamp, the ball becomes lost to the vision and a short time elapses before the eye reaches its normal condition. Obviously any high-intensity light at the end of the court is objectionable.

The distribution of light must be such that the ball will be illuminated by direct light at a height of approximately 20 ft. Above this height the reflection from the court surface will sufficiently

Fig. 1.—Night View of Two Tennis Courts Illuminated by the Side-Lighting System.

illuminate the ball, for at this height the ball is usually traveling comparatively slowly.

The entire installation must be so arranged as to eliminate any danger of interference with the

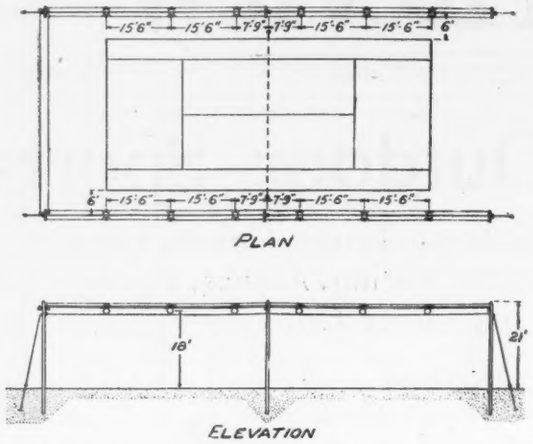


Fig. 2.—Arrangement of 500-Watt Type C Lamps and Angle Reflectors in Side-Lighting System for Tennis Courts.

play. The lighting units themselves must be at a sufficient height or a sufficient distance from the side lines to be out of range of the ball. The supports (posts, etc.) must be so located as not to interfere with the player both at the side lines and the run back.

With the above rather exacting conditions in mind, one immediately questions if the artificial lighting of tennis courts has proved satisfactory and if it is practical. That it is satisfactory is evidenced by the tennis clubs that have installed artificial lighting. Members that have played under artificial light have at once become enthusiasts.

Regarding the practicability of such an installation, we must consider first the cost of installation. In the present day of varying prices it is impossible to give specific figures which would be of value in different localities, and suffice it to say that the systems recommended are relatively simple and low in cost, well within reach of any club or individual having a private court. The pleasure incident to night playing is a large return on the investment.

The power required varies with the system in use from 4000 to 6000 watts, which, at the rate of 10 cents per kw-hr., means an expenditure of

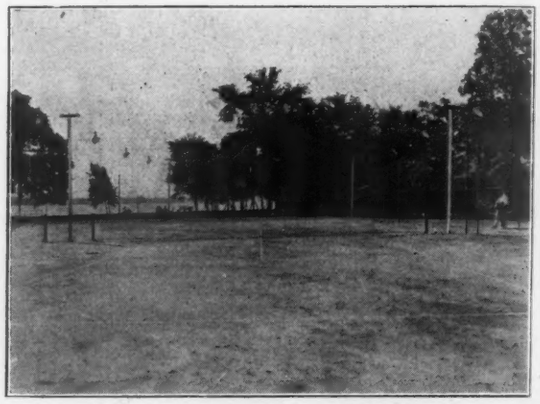


Fig. 3.—Day View of Tennis Court, Showing Method of Suspending Fixtures From Guy Wires.

40 to 60 cents an hour. Counting a reasonable return on the investment, and allowing for lamp renewals, the cost of lighting tennis courts is well below the amount one would spend for playing pool or billiards.

Two methods are generally employed for tennis-court lighting. These have been designed to meet the requirements outlined above. Practically all artificially lighted tennis courts use one of these two systems, although they are possible of several modifications.

In the side-lighting system, as the name implies,

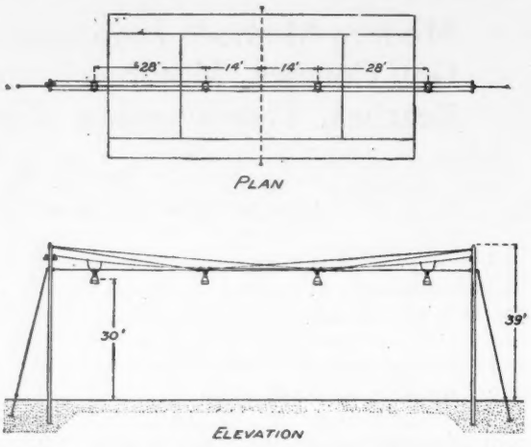


Fig. 4.—Location of 1000-Watt Units in Overhead System for Tennis Courts.

units are hung at a moderate height along the sides of the court; while in the overhead system they are placed far above the ground over the center line of the court. These two systems are the result of considerable experimentation and have been found very satisfactory in service, as evidenced by the number of courts throughout the United States and foreign countries using these forms of lighting.

The United States National Lawn Tennis Association endorses night tennis when the installa-

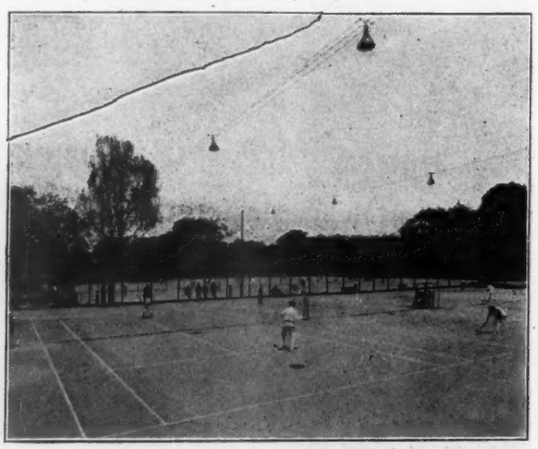


Fig. 5.—Day View of Tennis Courts, Showing Method of Suspending Overhead Units.

tion is properly laid out to obtain the desired playing conditions. The maintenance of the system is practically nil, save for an occasional cleaning of lamps and reflectors.

The side-lighting system is shown in plan and elevation by Fig. 2. It calls for twelve units, six

Fig. 6.—Night View of Putting Green and Clock Golf Course, Illuminated by 750-Watt Lamps in Bowl Reflectors.

on each side of the court, being spaced and hung as shown; 500-watt Mazda C lamps, with suitable angle-type porcelain enameled reflectors and weatherproof holders are used.

Some courts are surrounded by netting, the supporting structure of which is of sufficient strength to allow mounting the units from brackets. Under other conditions it is advisable to suspend the lighting units from cables stretched between posts or poles. Three of these on each side are desirable. The appearance will then be as indicated in Fig. 3. The supporting cable should consist of ⅜-in. galvanized stranded steel wire. The lamps and reflectors may be attached to this by any suitable hanger. In order to keep the units in alignment, a smaller wire should be strung between the poles even with the bottom of the reflectors, and each reflector attached to this by means of a piece of wire passed through a small hole punched in the rim of the reflector.

LIST OF MATERIAL NEEDED FOR SIDE-LIGHTING SYSTEM.

500-watt type C lamps	12
Metal reflectors	12
Socket holders	12
Hangers	12
25-ft. wooden poles	6
⅜-in. galvanized stranded steel wire, ft.	350
No. 12 galvanized iron wire, ft.	250
No. 8 weatherproof copper wire, ft.	600
No. 14 weatherproof copper wire, ft.	75
Double-pole, single-throw, 60-ampere switch	1
Weatherproof service box	1
Crossarms with pins, insulators, lag screws and braces	8
Guy anchors with turn and clamps	4

The overhead lighting system in plan and elevation is shown in Fig. 4. This system calls for four 1000-watt type C lamps equipped with deep-bowl enameled steel reflectors and special skirt with weatherproof socket holders. They should be placed as indicated in the dimensioned drawing. The fixtures should be suspended from galvanized stranded cable, stretched between 45-ft. posts. The hangers may be the same as they used for the side-lighting system, or, more preferably, automatic cut-out hangers which make it possible to lower the units for replacement of lamps. A daylight view of tennis courts with the overhead lighting system is shown in Fig. 5.

The conditions to be met in this class of lighting are similar to those of the tennis court although not as exacting. There must be sufficient light to enable the player to follow the ball after the stroke and to make out easily the outline of the hole on the putting green. The illumination should be fairly even in order that one will not be misled in judging distances and in sizing up any irregularities on the green. The distribution of light from the units should be wide so that one may find the ball in case it is driven off the fair green. The lighting accessories must be so located as not to interfere in any way with the play.

Each particular court is to a certain extent a problem of its own and thus requires special attention. The example shown in Fig. 6 will show how one club met the lighting requirements of its court and clock golf courses. The lighting units are suspended from crossarms attached to iron poles embedded in concrete. The spread of the crossarms is 18 ft. and the units are 14 ft. above the ground. Six 750-watt type C lamps equipped with steel reflectors are used.

Lighting of Motorcycle and Bicycle Racing.

There are doubtless many such courses in the country whose utility ceases as soon as it gets dark. Although the installation noted above might not exactly fit another course, yet it shows that with proper care it is entirely feasible to illuminate this particular branch of outdoor sports.

LIST OF MATERIAL NEEDED FOR OVERHEAD SYSTEM.

1000-watt type C lamps	4
Metal reflectors	4
Metal skirts	4
Socket holders	4
Hangers	4
45-ft. wooden poles	2
¼-in. guy and messenger cable, ft.	450
No. 8 weatherproof copper wire, ft.	325
No. 14 weatherproof copper wire, ft.	25
Double-pole, single-throw, 60-ampere switch	1
Weatherproof service box	1
Guy clamps	10
Anchors	2
Strain insulators	2
Crossarms with pins, insulators, lag screws and braces	2

Motorcycle and bicycle racing has become so popular in the past few years that many races are

held at night. This, of course, means that artificial light must be provided. Racing, especially with motorcycles, has a certain element of danger even under the best conditions. Unless the track

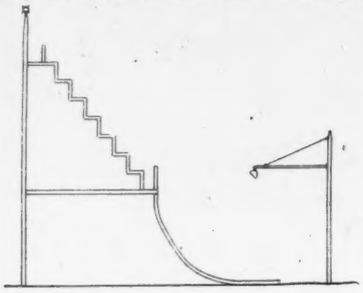


Fig. 7.—Section of Motordrome, Showing Location of Units for Lighting Track and Seats.

is properly lighted this danger will be greatly increased.

The scheme outlined in Fig. 7 meets the requirements for this class of service. Medium-sized type C lamps (300 or 500 watts) should be used, equipped with enameled steel angle reflectors that project the maximum light at approximately 45 deg. from the vertical. The units should be so located as to project the maximum light a little above the central portion of the track. While it is necessary to locate the units above the lower portion of the track they should be suspended from brackets in order that the supporting posts may be removed several feet from the track to eliminate danger. The posts should be spaced approximately every 20 ft. The height of the units will depend on the contour and height of the track.

This system has the following advantages. A number of small units produce more uniform illumination than fewer larger units. The failure of one unit does not leave a comparatively large section of the track in darkness. The light is absolutely steady. There is no glare for either the riders or spectators. This feature adds to the safety of the former and the comfort of the latter.

In addition to the units required for the track proper there should be additional low-wattage lamps at the back of the spectators to aid in finding seats and reading programs.

Lighting of Outdoor Areas.

The illumination of outdoor areas sufficiently large to be used for auto polo, drilling, football, hockey, skating, playgrounds and athletic contests in general offers exceptionally interesting problems. Three methods of illumination are employed as follows:

(1) Suspending units over the area by messenger cable strung between poles. The units must be hung at a sufficient height to eliminate any danger of glare to either the observers or players. The spacing must be such that for the hanging height and type of reflector employed the illumination is reasonably uniform.

(2) Lighting from units located at the sides employing standard angle-type reflectors. These must be suspended at such a height and in such position as to avoid annoyance to observers in the stand or the players.

(3) The employment of floodlighting projectors located on the roof of the grandstand, adjacent buildings, special poles or even trees.

Each particular system has certain advantages. The one to be selected will depend upon the area to be lighted and local structural conditions. If the field is comparatively small and only a low intensity is required, as, for example, of a small drill field, skating pond or playground, and poles can be erected without difficulty, the overhead system employing medium-size type C lamps with standard distributing reflectors is probably the most simple of installation.

Where there is a grandstand or similar structure and the area to be lighted is comparatively narrow, angle-type reflectors fitted with standard

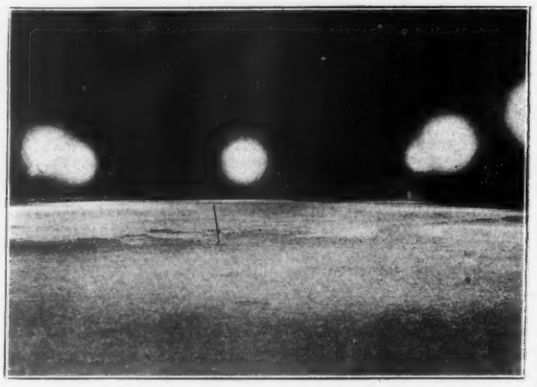


Fig. 9.—Night View of a Drill Field Lighted by 750-Watt C Lamps and Angle Reflectors on Poles at Edge of Field.

type C lamps are inexpensive and easily installed. This particular arena was used in the evening for acrobatic acts, chariot races, zouave drills, auto polo games and the like. It can be readily seen from the illustration that the lighting results were quite staisfactory, although slightly less than 0.4 watt per sq. ft. was employed.

For lighting areas too wide to permit the use of the overhead system and where only a low intensity is required, angle-type units located on poles around the edge of the field as pictured in Fig. 9 prove satisfactory. They are much less expensive than floodlighting equipment.

Where the area to be lighted is wide and a relatively high intensity of illumination is desirable, floodlighting equipment offers the best means of solution. The type of floodlighting projector employed will depend on the available means of support and the distance between units. A night view of a notable installation of this form of lighting is given in Fig. 10.

The lighting of a skating pond is a very simple

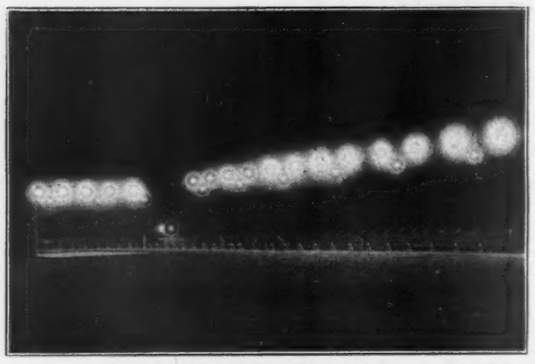


Fig. 8.—Night View of a Horse Show Arena Lighted by 1000-Watt Lamps in Angle Reflectors.

Fig. 10.—Night View of Sheepshead Bay Speedway Taken From End of Grandstand—Illumination of Track and Field Accomplished by Floodlight Projectors.

matter. Only a low intensity is sufficient for safety, and directional and shadow effects are relatively unimportant. If standard street-lighting units are located near the side of the pond, there will be sufficient spread of light to illuminate the area for adjusting skates and the ice itself. Where the intensity from these is inadequate, one or more floodlighting projectors prove of considerable value and produce an effect as indicated in Fig. 11.

The following table gives the desirable intensity for various outdoor sports.

Drilling—	Intensity in foot-candles.	Watts per sq. ft.*
Small areas	0.5 -1.5	0.07-0.22
Large areas	0.1 -0.3	0.02-0.05
Football	1.0 -2.0	0.15-0.30
Hockey	2.0 -3.0	0.30-0.50
Polo—		
Horse	1.5 -2.5	0.2 -0.40
Auto	1.0 -2.0	0.15-0.30
Skating	0.25-0.75	0.03-0.10
Playgrounds	0.25-0.75	0.03-0.10

*Based on the use of high-power type C lamps and efficient reflectors.

It is a relatively simple matter to light a beach so that it is safe for night bathing. The nature of the average beach is such that the lighting units must be placed a considerable distance from the water, and for this reason floodlighting projectors offer the best solution. They should be placed 30 ft. or more above the beach, and, when possible, located in two banks about 100 ft. apart, so as to provide light from more than one direction. Hotels or other buildings adjacent to the beach usually provide convenient means of mounting the projectors. Approximately 0.25 foot-candle is ample for this class of lighting.

As difficult as the problem may seem, the successful lighting of ranges for trap shooting is an established fact. One method of lighting is shown in Fig. 12. Four projectors are used, located behind the shooter's stand or handicap positions 20 ft. above the ground. Each of the projectors is equipped with a 1000-watt type C lamp. The lamps should be focused so that the spread to the light will be approximately 30 deg. After installing the units they should be pointed in the direction indicated by the lines on the diagram at such an angle vertically the illumination on the ground at the limit of travel of the clay pigeons will be even. Having obtained this condition each projector should be pointed upward the same amount until the lower edge of the beam of light is approximately as shown in the elevation.

This method has the advantage of simplicity of installation and operation. There is sufficient direct light from the units to illuminate the shooter's stand. The light covers the entire area over which the pigeons will be thrown with sufficient intensity to make them conspicuous. The cost of operation is low. The energy required is 4000

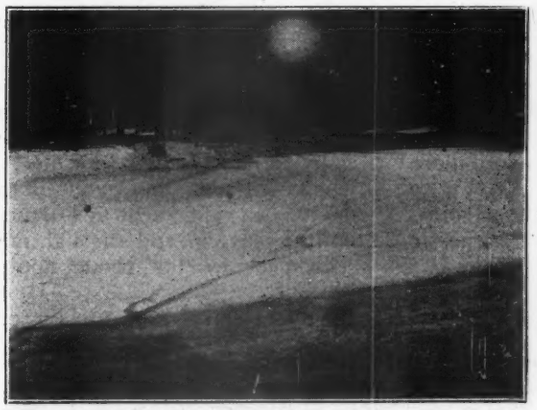


Fig. 11.—Night View of a Small Pond Illuminated by a Single Projector Unit.

watts, which at 10 cents per kw-hr. will cost 40 cents for each hour.

In some instances projectors have been located on the roof of the trap house, as shown in Fig. 13, with successful results. In this particular installation only three 500-watt floodlighting projectors were used. Later experience, however, has shown that the higher intensity recommended above is more desirable.

The method outlined above is for a standard range. There are many clubs, however, that do not have a standard range. Such an example as

this is the Sportsman's Show held at the Grand Central Palace, New York City, several years ago. The traps were located on the roof of the building, the distance from the shooting platform to the steel partition being approximately 135 ft.

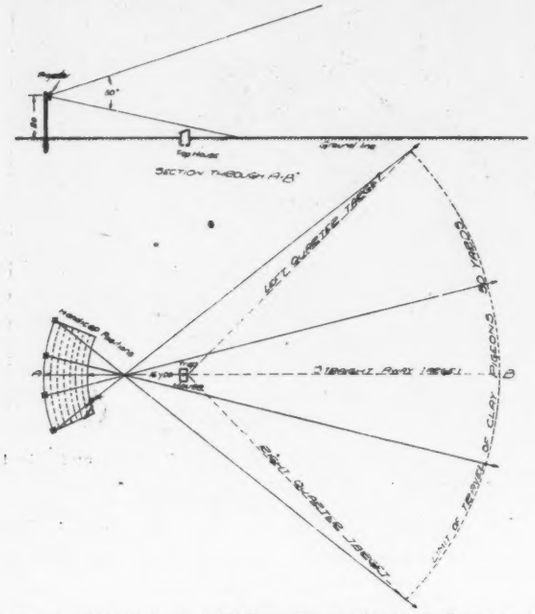


Fig. 12.—Method of Lighting Trap Shooting Ranges in Plan and Elevation.

The partition was 25 ft. high and was in the shape of a semi-circle 85 ft. in diameter.

The lighting designed by the New York Edison Co. was as follows: Approximately 10 ft. in front of the bird house, which was 40 ft. from the shooting stand, were located three 750-watt type C lamps. These lamps were equipped with mirrored glass reflectors which were directed so as to throw the light at the partition. Each reflector was so pointed as to throw the maximum amount of light at a different angle in relation to the gunner. About 38 ft. in front of the battery of reflectors was placed a mirrored trough reflector 10 ft. long, in which were located ten 100-watt concentrated-filament lamps. These served more especially to light the partition itself.

In Fig. 14 is shown in plan the layout of a roque court. This game is a refinement of croquet requiring more skillful playing, and the lighting conditions as outlined below for roque apply equally as well to croquet.

Athough the requirements for this class of sport are not as severe as for some of the more strenuous games, yet care must be taken in the location of lighting units to insure satisfactory results.

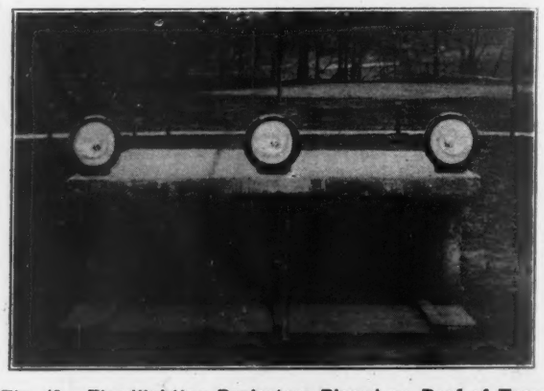


Fig. 13.—Floodlighting Projectors Placed on Roof of Trap House for Night Shooting.

The scheme as outlined calls for four 100-watt bowl-enameled type C lamps located as shown near the corners of the court. Each lamp should be equipped with an RLM standard dome reflector and weatherproof socket holder. The units should be hung approximately 12 ft. above the ground. As any posts within the boundary lines of the court would interfere with the play, it is necessary to locate them outside, suspending the lamp and reflectors from bracket arms. By this arrangement, even illumination of a moderate intensity is provided over the entire court. One may play from any position without the ball being in shadow.

Although two units might be used, located toward each end and over the center line, yet the four-light system is far preferable. With two units the player will cast annoying shadows on the ball or wicket when playing at the sides.

A large percentage of croquet and roque playing is done in the early evening hours in order to avoid the heat of the day. One plays the game as late as possible and in order to prolong the time of play the wickets are often indicated by a piece of white cloth tied to the top of the wicket. By artificially lighting a court the hours of play are not dependent on the hours of natural light. The cost of operating a system of this kind with energy at 10 cents per kw-hr. will be 4 cents per hour.

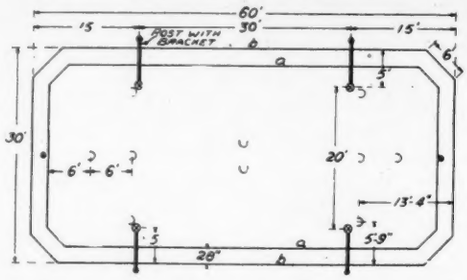


Fig. 14.—Diagram Showing Layout of Roque Court and Location of Lighting Units.

Conclusions.

An attempt has been made to outline some of the features in lighting the most common forms of outdoor sports. It is evident that considerable variation may be found as to type of equipment, system of lighting and intensity employed. As with any field of illumination there are no hard and fast rules to adhere to and each case presents certain features of its own.

In common with indoor installations careful maintenance is necessary if the best results are to be obtained. The units employed should always be of a weatherproof type not subject to deterioration with the action of the elements.

As is the case of any device used out of doors special attention must be paid to durability and strength. The force of the wind, the weight of accumulated snow and such tend to loosen fastenings and unless precautions are taken the swaying motion soon causes minute cracks to appear in porcelain enamel or other protective surfaces.

Interior of F. C. Lenihan's Electric Shop in Mendota, Ill., Showing Display of Lighting Fixtures.

Decorative Home Lighting Offers Lucrative Field

Electrical Contractors May Profit by Trend of Present Time Toward Electrical Decorations for Homes, New or About to Be Remodeled—Period Fixtures and Special Designs Obtainable

By FRANK H. MILLER

Sales Manager, Beardslee Chandelier Manufacturing Co.

The contractor-dealer who considers himself the "electrical decorator" of the home has begun to understand the possibilities of developing the home-lighting business in his community. However, in order to really get the conception of his place in the more-or-less involved business of building and equipping a home he must, first, last and all the time, consider himself, in a professional sense, an "electrical doctor."

When a person has appendicitis he doesn't "shop around" to find out what surgeon will charge the lowest fee for operating. He gets the best surgeon he can find because he wants *service* more than a low price. In this conception of his business—that of "doctor of electricity"—the contractor-dealer is putting his business on a higher plane and can, therefore, command more for his services.

Although comparatively few homes are being built at the present time a considerable amount of remodeling is being done, and in a short time, economists say, the country will witness one of the greatest home-building booms in its history. The wise contractor-dealer, by studying the possibilities of his field today, will be improving his opportunity by preparing for the rush of business that is bound to come.

Classification of Homes for Electrical Needs.

Among the points to be considered in the subject of home lighting from the contractor-dealer standpoint is that of the natural division of homes into classes according to their cost. For the purposes of discussion homes may be divided into four classes: those costing less than $5000, those costing more than $5000 but less than $15,000, those costing more than $15,000 but less than $35,000, and those costing more than $35,000.

The home costing less than $5000 is not generally being built today because of the high cost of everything entering into its construction. In this class, however, may be included those homes which were put up a few years ago and in which considerable remodeling is being done. Included in this remodeling is rewiring and "electrical decoration." Perhaps the owner feels that building prices will not come down for several years and intends to make his dwelling more habitable despite the fact that his present income would

permit him to reside in a much more expensive home.

Then there are a number of $5000 homes being built on speculation. These may be a source of business for the contractor-dealer. These "built-for-sale" homes are, however, usually electrically decorated at the least possible expense. In some

Installation in Clinton (Ia.) of Cast-Brass, Hand-Chased, Eight-Lamp Chandelier and Two Double-Candle Brackets.

cases contractors and architects are urging more outlets and a better grade of fixtures with the thought that the prospective buyer will demand a more modern system of lighting.

Illuminating Opportunities in Hall, Living Room and Dining Room.

Perhaps the largest class of homes being constructed today are those ranging in cost between $5000 and $15,000. When a home of this class is being built for the future owner it opens a better business opportunity for the electrical contractor-dealer. The owner will spend more money on the electrical decorations and demand a better class of work. If a home of this class is constructed by a speculator he has usually determined upon a certain cost for lighting and keeps that figure in mind when planning his wiring and selecting his fixtures. In that case it is up to the electrical contractor-dealer to convince the building contractor that more outlets and better illuminating equipment will be necessary.

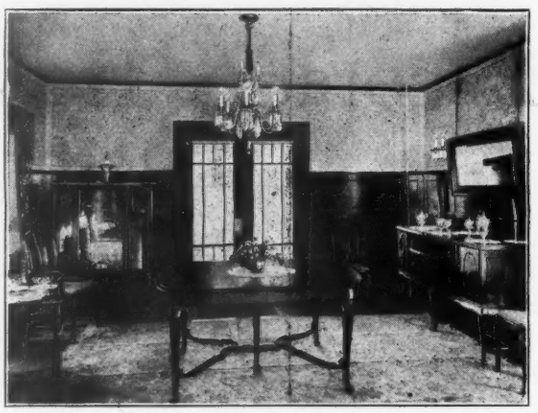
The hall, living and dining room offer the best opportunities for the electrical contractor. For

Period Chandeliers and Brackets Installed in Ottumwa (Ia.) Home by Safety Electric Co.

the hall, pendent fixtures in lantern design are very acceptable. This lantern is generally depended upon to serve as the main source of illumination in hall or vestibule. Bracket fixtures or torchiers are appropriate for bringing out such points as the staircase or prominent entrances to main rooms. One of these fixtures may be used for a "night light." There should be at least one baseboard connection in the hall.

Importance of good lighting in the living room cannot be over emphasized. The omission of the center fixture is sometimes advocated but it is generally conceded that this is seldom a good plan. Good general illumination is obtained by installing the fixture close to the ceiling. The light should be screened to avoid glare and to give good distribution. Baseboard plugs should be placed on each of the four sides of the room, and in the alcove or sun parlor if one exists. It must be remembered that these base plugs do not cost much at the time of general installation but are more expensive if installed after the wiring is completed. If the room has a mantel or fireplace, brackets or standards may be installed on each side. Single-lamp torchiers are much in favor for this purpose and generally improve the appearance of the room.

As candle-type chandeliers are usually associ-



Crystal Prisms and Festoons on Six-Lamp Chandelier, Supplemented by Two Double-Candle Brackets.

ated with the dining room this is a good type to recommend for illuminating this important room. A nice effect is obtained by the use of colored silk shades over frosted lamps, the color of the silk being selected to harmonize with the general color scheme of the room. These shades serve to direct the light downward onto the dining table.

There should be at least one baseboard plug for the serving table for the purpose of connecting the electric percolator, and perhaps another plug for the toaster or grill. Brackets are an added feature in the dining room but are largely decorative. Often the general arrangement of the room will make brackets desirable, or where there is a built-in sideboard, they are frequently necessary to carry out the general scheme of decoration.

While the above suggestions are made for the inexpensive homes they apply as well to any dwelling costing up to $15,000. Considering the homes costing between $15,000 and $35,000, the electrical contractor-dealer may command the help of manufacturer's salesmen in selecting and

Fixture Salesroom of Charles A. Meador Electric Co., Springfield, Ill., Which Specialize in Large Chandeliers and Other Lighting Fixtures.

estimating the equipment. This class of business is very profitable if rightly handled. If particular designs are desired the manufacturer can be counted upon to co-operate. This is also true when figuring on illuminating equipment for homes costing more than $35,000. Where such special service is warranted the manufacturer can be depended on to place at the service of the contractor-dealer his entire designing department.

Frequently this class of work requires fixtures in period design. The manufacturer's salesman can help in the selection of suitable lighting equipment if this is the case. Contractor-dealers should have no hesitancy about figuring on fixtures in period design. It is a simple subject to the manufacturer and he is able to make suggestions which will be correct and save the dealer a great deal of trouble and worry. In this class of work the dealer and architect should get together as it is by such co-operation that a more satisfactory decorative effect can be secured at comparatively small cost.

Although the subject of period design is an exhaustive one, the contractor-dealer will find with a little study that its relation to his own business is simple and that he can master a few necessary principles with ease. When original sketches are furnished by the manufacturer they represent a considerable expense and should be handled carefully. A cabinet in which they can be kept for future reference should be installed at a convenient place in the show-room or shop. The same suggestion may be applied to catalogs, as it is often desirable to go over one or more of them with a prospective customer, architect or building contractor. The books should, therefore, be kept neat and free from dust.

The contractor-dealer in concentrating upon the home-lighting field, should decide upon the extent of territory he can actually serve and should become acquainted with the architects in this territory as well as with reputable building contractors. He should also acquaint himself with the general building conditions. Gossip can often be depended upon to acquaint him with the names of those who contemplate a new residence or the remodeling of an old home.

Preparing Plans for Comprehensive Home-Lighting Campaign.

In selling lighting fixtures to the better class of homes the contractor-dealer will find it more profitable to talk less about "candle-power", "watts", "foot-candles" and such things, and talk instead about home beautifying, decorative treatment and the subtle charm obtained when various colors and hues are used in connection with the illuminating effects. It is a well-known fact that illumination or lighting equipment, or both, can make or mar an otherwise handsomely furnished room.

In planning his campaign the contractor-dealer may secure a large map of his town, or if his sales are confined to a certain district in a large city, secure a map of that section. He can then locate on the map all the homes using electric service—all of them possible customers for his store. He may designate the value of the home and the size of the prospective customer's purse by different colored crayon marks or tiny flags. The marks or flags may be keyed for reference to a card index containing the names of owners and addresses.

In the list of better homes there will be found a number which were built 10, 15 or 20 years ago, and which contain beautiful rugs, draperies and furniture, but are still equipped with old-style lighting fixtures in the living room, library and dining room. It is not difficult to sell these peo-

ple lighting equipment that will do justice to the furnishings and other decorations if they are approached in the proper manner. The mother and daughter probably hate the sight of the old fix-

Period Dining Room Illuminated With Period Chandelier and Brackets.

tures and have long wished to change them for something more attractive. If the proper seed of thought is planted it will be only a matter of helping with the selection and taking the order.

Different contractor-dealers employ different methods to secure the first interview. Sometimes a personal letter paves the way to the first call. Sometimes a call and the presentation of a business card, with a suggestion regarding new and attractive fixtures, induces the train of thought that results in a later order. Once the contractor-dealer is invited to "look over the place," he will find plenty of opportunity to suggest a few simple changes that will, without doubt, lead to a sizable order. It will be found that the prospective customer was only waiting for someone to advance the proper information. Then it is up to the contractor-dealer to do his work neatly and satisfactorily so that he will be welcomed back for future installations.

JOBBER'S REPRESENTATIVES VISIT INDUSTRIAL LIGHTING EXHIBIT.

A group of about 25 city and country salesmen from the Electric Appliance Co., Chicago, visited the industrial lighting exhibit of the Commonwealth Edison Co., Jan. 3, and were given a practical demonstration and lecture on correct lighting for various industrial purposes by J. R. Colville, manager of the technical publicity department of the National Lamp Works, Cleveland, with the assistance of James J. Kirk, illuminating engineer of the Commonwealth Edison Co., in charge of the exhibit.

STUDENT-SALESMEN'S SCHOOL CONDUCTED IN CLEVELAND.

Cleveland Electrical League Back of Movement to Educate Salesmen in Modern Methods of Selling Electrical Goods.

A school for electrical salesmen was recently started by the Cleveland Electrical League for the purpose of educating salesmen in the art of selling electrical goods. L. H. Reiss, who has had a wide experience in the sales end of the manufacturing, jobbing, retailing and specialties business, has been retained as instructor.

The reason for inaugurating a movement of this kind is summed up in the following statement by J. E. North, one of the active members of the Cleveland Electrical League: "We found in Cleveland that a large number of prospects were slipping away from us unsold, so we decided to investigate the cause. The first observation was the lack of what might be termed efficient salesmen, which could not be laid to employers so much as to the entire industry in not getting together earlier to formulate more scientific methods in handling merchandise."

The instructor mapped out a course covering electrical goods for the student-salesmen to follow, the methods of making a thorough analysis of products to determine the best sales-talking points, etc., being pointed out. Each day Mr. Reiss demonstrates how the students should fit into their organization and what is expected of them. This is followed by an open discussion in which the difficulties of each individual are

Mr. Electrical Employe:

Consider the Boss. All is not a bed of roses with him. There are many thorns. "Uneasy lies the head that wears a crown."

He has responsibilities beyond yours. He has invested time and money; made many sacrifices and practiced much self-denial that he might give you a job and keep you on it.

You have your job. He has his also. A sincere appreciation from you of his job will be welcome. Work with him, not against him.

In working with him you are making a place for yourself. Have confidence in him. Believe that he knows what you are doing and that when the time is ripe your advancement will result—if you are deserving of it. Remember, we get what we deserve.

Be interested in your job. Love it. If you do not your job will soon find another lover. If for any reason you can not conscientiously love it—leave it. Go where you can be truly loyal. Such action on your part is not only just to yourself but to your employer also.

If you love your job cultivate that love to its maximum. Use your head, heart and hand, with courage, initiative and understanding in the interest of true service.

Then the world will have no closed doors to you.

Mr. Electrical Employer:

Consider your employe. The law of—"As we give so we get"—applies to him and you alike. If he gives he is entitled to get.

We are none of us independent but all grandly inter-dependent. The aggregate of real man power makes your institution.

The give and get refers not alone to money. A certain large dairy company advertists the fact that it keeps its cows contented so that they will give better milk.

Of course, men are not cattle, but the law works alike in all the realms of nature. Men can do better work and more of it if they feel contented on the job. If they are discontented they can not love their jobs.

Money alone will not meet with all results desired nor will paternalism. True interest—whole-hearted—a combination of elements making for "Fraternalism"—as A. F. Sheldon points out, is the essential. It is the attraction that binds, that lasts.

We have come to a realization that man is his brother's keeper. The keener we sense this fact and act accordingly, the greater the employe's effort to work for and with us, all things being equal, in rendering better service to the public.

And it naturally follows: "The greater the service the greater the profit. He profits most who serves the best."

These letters are lifted from the final lesson in the Electrical Sales School, conducted by the Electrical League. Each of the twenty lessons is printed in pamphlet form so that those who take advantage of the course may benefit by them in the years to come.

The lessons are prepared by L. H. Reiss, school director. They are being copied in other cities by groups of electrical men who have decided to open similar schools.

THE ELECTRICAL LEAGUE OF CLEVELAND.

Sample Letter Used at Salesmen's School Conducted by Cleveland Electrical League.

brought out. Every group in the electrical industry in Cleveland is supporting this movement and the results so far obtained indicate that the school is doing some excellent work.

DISCUSS RADIO TRANSMITTERS AT NEW YORK MEETING.

A paper on "Naval Radio Tube Transmitters," by T. Johnson, Jr., formerly expert radio aide of the United States Navy, was the feature of the Jan. 5 meeting of the Institute of Radio Engineers in New York City. The speaker described the construction of the latest types of continuous-wave telegraph and radiophone transmitters for various outputs.

Lighting Fixture Industry Ready for Buffalo Convention

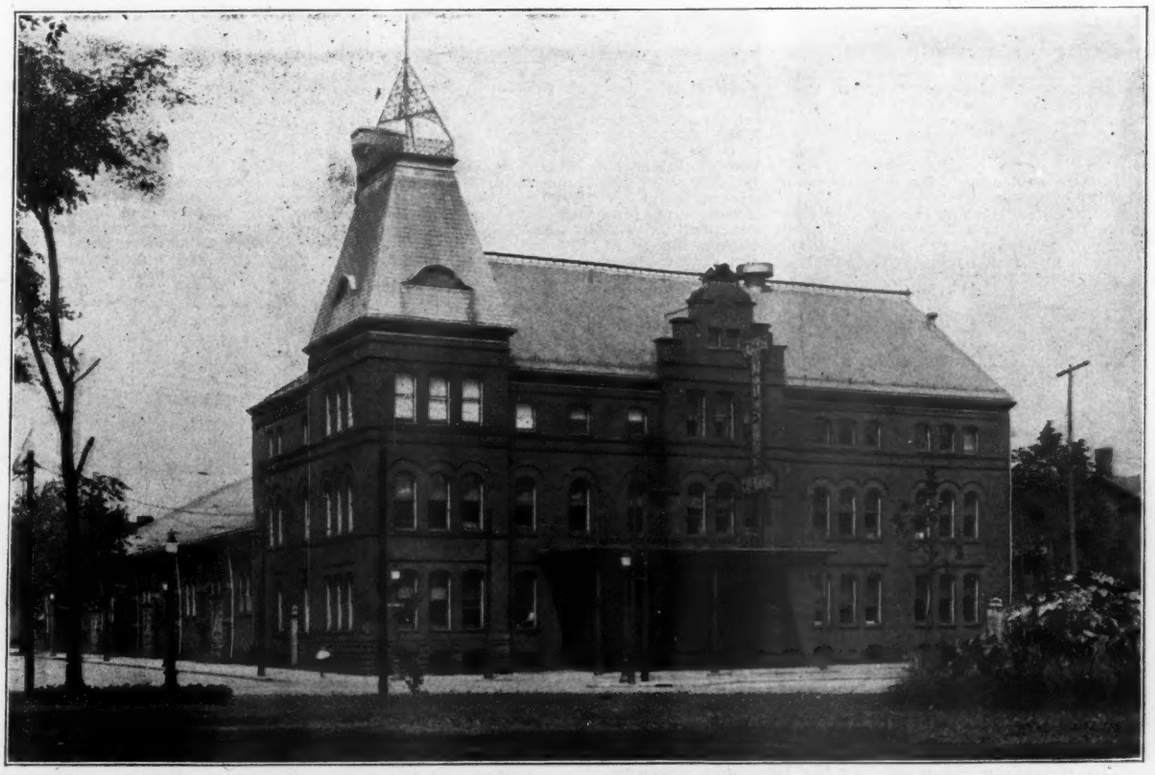
Fixture Market and Buffalo Better Lighting Week Features of Second Annual Convention to Be Held Feb. 14-19 Under Auspices of National Council of Lighting Fixture Manufacturers

Three conventions are scheduled for the Buffalo fixture market week, Feb. 14-19, at which every branch of the lighting fixture industry will be represented. The convention of the National Council of Lighting Fixture Manufacturers will represent the manufacturing side of the fixture business, that of the Lighting Fixture Dealers' Society of America will discuss the jobbers and dealers' problems, and the Illuminating Glassware Guild will represent the third important group in the lighting fixture business. This promises to be the greatest display of electrical lighting fixtures, supplies and appliances ever held under one roof. The exhibits will be displayed in the Elmwood Music Hall where space has been provided for 74 principal exhibits and a number of smaller booths.

In connection with these three conventions there are two other important features to be staged, viz., the annual fixture market and the Buffalo Better Lighting Week. The latter is a new development of the National Council's efforts to improve the status of the lighting fixture industry. The sessions of the National Council of Lighting Fixture Manufacturers' will be held at the LaFayette Hotel and the Lighting Fixture Dealers' Society of America will convene in the Iroquois Hotel.

Realizing that every branch of the industry depends for its continued prosperity upon the ultimate consumer of its products, the National Council has organized a comprehensive campaign through the local newspapers and industrial, electrical and civic associations to educate the great buying public in the advantages of better lighting from the standpoint of health, industrial efficiency and safety. One of the most interesting and at the same time practical features of this educational campaign is the system of "free lighting surveys" which will be carried out all over the district during the week of the convention and fixture market.

The large organizations of Buffalo will, however, be afforded the unique opportunity during the week of Feb. 14-19 of having at their disposal without any charges the services of a joint committee of illuminating engineers, contractors and dealers who will visit each store, office or factory from which they receive a request for a "free survey", and who will submit a report giving definite facts and figures on the installation in question, together with suggestions for



Elmwood Music Hall, Buffalo, N. Y., Where Second Annual Fixture Market Will Be Held.

improvements in lighting and exact details of the type of fixtures by means of which these improvements can be most effectively and economically accomplished. Whenever possible a choice will be offered of different maker's fixtures, but in all cases the primary consideration will be the ultimate advantages of the customer in the way of better lighting.

The fixture market will follow very closely upon the lines of the previous one held February, 1920, in Detroit. It will, however, be on a considerably larger scale. In an effort to provide more space for the exhibits than was possible at Detroit the National Council leased the large Elmwood Music Hall at the corner of Elmwood and Virginia streets, Buffalo, for this year's exhibits. The available booth space was all contracted for some weeks ago by fixture manufacturers who realize this great opportunity to show their customers, the jobbers and dealers from every part of the United States, the latest styles of artistic commercial and industrial fixtures prepared for the 1921 season.

The program has been arranged so that the business sessions will be held in the morning of each day, leaving the afternoon and evening for the delegates to inspect the exhibits. Joint luncheons with the three organizations will be held each day, commencing with Tuesday, and prominent speakers will address each gathering.

The tentative program for the business sessions follows:

Monday Morning.—Gathering of delegates and registration.

Monday Afternoon.—Meeting of executive committee.

Tuesday Morning.—Address by President Fred R. Farmer, giving a review of the work of the past year; "The Stimulating of Designing Ability," by W. R. McCoy, Cassidy Co., Inc., New York City; "Is the Type C Lamp a Practical Source of Light for the Average Home," by W. E. Cochran, Art Metal Manufacturing Co., Cleveland; report of the design committee appointed at the Detroit meeting for the purpose of setting up a method of procedure to eliminate design copying; appointment of various committees.

Wednesday Morning.—Theme, "The Industry Serving Itself," discussed by Herman Plaut and Bernhard Blitzer of the New York division; William Horn, president of the Philadelphia division; W. E. Cochran, president of the Cleveland division; C. G. Everson, president of the Chicago division; Arthur Polacheck, president of the Milwaukee division; E. F. Guth, president of the St. Louis division; Messrs. Symes and Gleason for the West Coast division.

Thursday Morning.—Theme, "Developing a Policy Within the Lighting Fixture Industry"; (a) "Classification of Customers According to Purchases," by Charles E. Verhunce, manager of R. Williamson & Co., Chicago; (b) "The External Educational Policy With Relation to the Public and the Architect," by C. S. Everson, C. G. Everson & Co., Chicago; (c) "Statistics of Our Industry, Their Value and Use," by a speaker to be announced later; (d) "Lighting Fixture Industry, Its Relation to Other Electrical Industries," by C. H. Caldwell, editor of *Electrical Merchandising.*

Friday Morning.—Reports of various committees, president and secretary; election of officers and unfinished business.

Saturday Morning.—Meeting of executive committee of National Council, and joint meeting of governing at Buffalo during the week.

Officers of the National Council of Lighting Fixture Manufacturers

William Horn, vice-president of the National Council and president of the Horn & Brannen Manufacturing Co., Philadelphia, by his genial personality and encouragement has done much to help the council in its already short but active existence. He was among the first of the manufacturers to fully appreciate the value of co-operation, a united industry and higher standards. The vice-president has worked diligently to promote the activities of the organization and to see to it that each event was carried out according to plans laid down for serving the best interests of the lighting fixture industry.

Fred R. Farmer, as president of the National Council, is credited with much of the rapid growth and popularity of the organization. In addition to being chief executive of the national body he is also president and guiding head of the Beardslee Chandelier Manufacturing Co., Chicago, one of the oldest and foremost lighting fixture concerns in the Middle West. He has shown his ability as an executive in the able manner in which he has presided at all the council's meetings. He was in charge of the Detroit convention last February and his untiring efforts materially aided in crowning the event with success.

Charles H. Hofrichter, who holds the responsible position of secretary-treasurer of the National Council, is also president of the Crescent Brass Manufacturing Co., Cleveland. He has given one-half of his time since Sept. 1, 1919, to the execution of the work of the council and to its further organization. The council could not have attained its present proportions without considerable hard, earnest plugging. To guarantee a steady advance from its very inception it required "nose to the grindstone" efforts on the part of some one and it fell to the lot of the secretary-treasurer to fill the role.

Executive Committee of National Council of Fixture Manufacturers

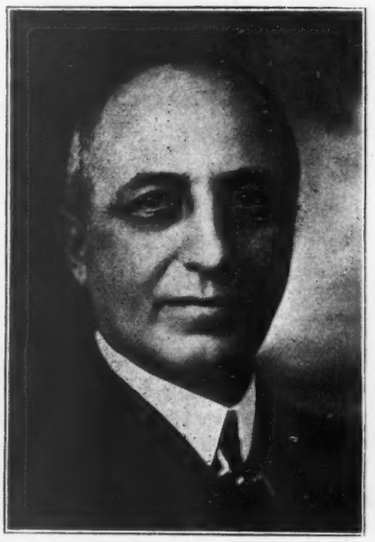
D. C. DeLancey has a knack of putting things across with a zip that defies failure. He is treasurer and manager of the Crown Electrical Manufacturing Co., St. Charles, Ill., and has been a constant booster and loyal supporter of the National Council and its aims since its debut in the industrial field. He declares that the future has wonderful things in store for the National Council. The Illinois man believes in every aim of the organization and has established a task for himself. He has determined to bend every effort to aid the National Council in dealizinfl all its objectives.

E. F. Guth, whose hobby is standardization in the production of lighting fixtures, is president of the Luminous Unit Co. and the St. Louis Brass Manufacturing Co., St. Louis. He has been a prime mover in promoting many of the innovations introduced since the organization of the National Council. Among other things he has blazed a trail in the production of standardized fixtures. In introducing this feature he, as well as other supporters of the movement, encountered many obstacles and delays, but at no time was there ever a serious letup in the campaign.

M. D. Blitzer is one of the aggressive executive heads of the Lightolier Co., New York City. He represents the downtown division of the metropolis on the executive committee of the National Council and keeps in close touch with the activities of the organization and the local section, ably presenting to the New York meetings a viewpoint which is marked by ability and progressiveness. He is a stanch supporter of the "Better Lighting Movement" and is a firm believer in organization efforts which have for their object the promotion of the best interests of the lighting fixture industry.

Herman Plaut, who is president of L. Plaut & Co., New York City, has been a most enthusiastic worker for the aims and objects of the Fixture Manufacturers' Council and has taken a very active part in all meetings and conventions of this body. The council has greatly benefited in more ways than one through his work. As the presiding head of the New York Division of the National Council he has done much to make the organization a substantial one. It has required earnest effort to build up an organization such as the New York Division boasts of and much of the credit for the achievement belongs to him.

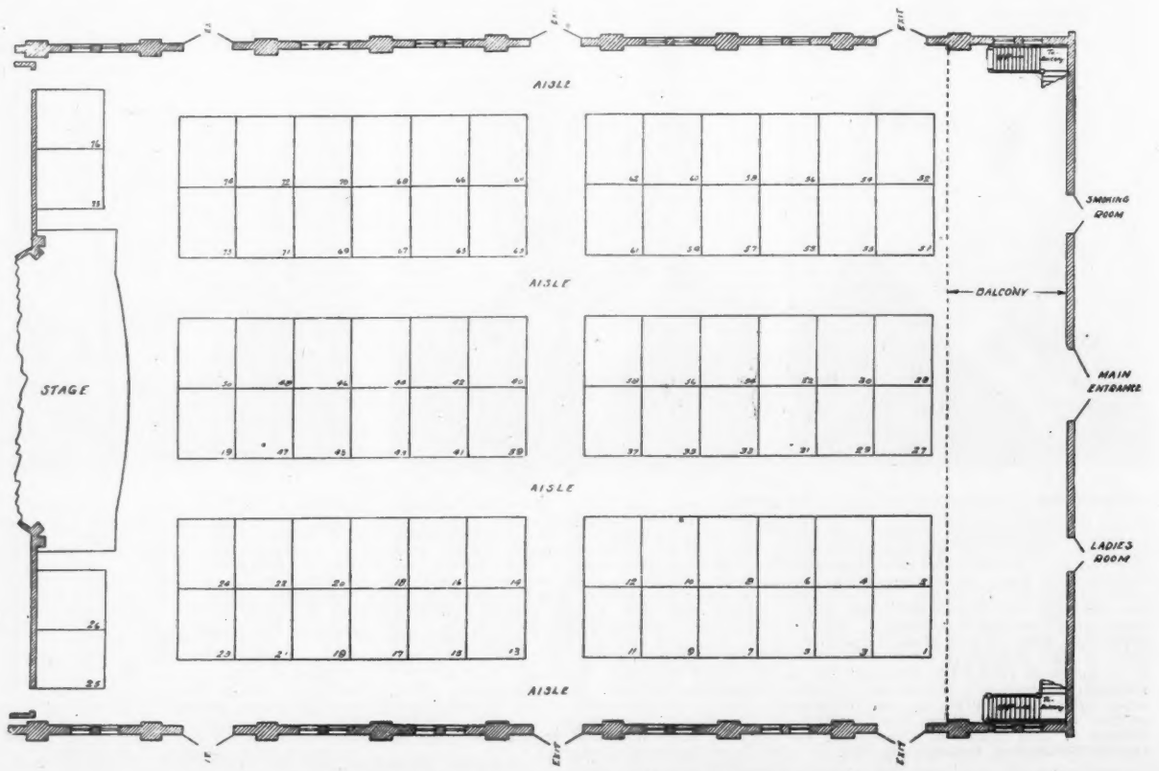
Benjamin F. Klein, president of the Kayline Co., Cleveland, has been one of the pioneers in the organization work of both the National Council and Cleveland Division. The secret of success behind most any organization is the foundation upon which it is built, and this is true of the Lighting Fixture Manufacturers' Club of Cleveland, one of the most powerful links in the chain of local clubs included in the National Council of Lighting Fixture Manufacturers. The Cleveland organization, of which he is president, has from the very outset been instrumental in the success of the National Council.



Arthur Polacheck, who is the active head of the Charles Polacheck & Bro. Co., Milwaukee, is one of the strongest advocates of fixture-trade co-operation. Although one of the recently appointed members of the executive committee of the National Council, he has shown a great deal of aggressiveness in the work of the organization to bring about a united industry. He is president of the Milwaukee Manufacturers' Club, one of the main links in the chain of local clubs included in the National Council of Lighting Fixture Manufacturers, and the Milwaukee organization is making rapid strides under his able leadership.

List of Exhibitors and Floor Plan of Exhibit Space at Elmwood Music Hall Where Buffalo Lighting Fixture Market Will Be Held

Lightolier Co., New York City.
William R. Noe & Son, New York City.
Perfectilite Co., Seattle, Wash.
M. Eisenberg, New York City.
Colonial Chandelier Co., New York City.
H. Northwood Co., Wheeling, W. Va.
Gillinder & Son, Philadelphia.
Highlands Manufacturing Co., Muncie, Ind.
Gleason-Tiebout Glass Co., Brooklyn, N. Y.
National Chain Co., College Point, L. I., N. Y.
Biddle Gaumer Co., Philadelphia.
Reliance Metal Spinning & Stamping Co., Brooklyn, N. Y.
Scott Ullman Co., Cleveland.
Star Glass Co., Star City, W. Va.
Art Metal Manufacturing Co., Cleveland.
Universal Metal Spinning & Stamping Co., Brooklyn, N. Y.
L. Beyer & Co., Cleveland.
Empire Metal Spinning & Stamping Co., New York City.
Mazzolini Artcraft Co., Cleveland.
Alt-Le Lighting Fixture Co., New York City.
United Metal Spinning Co., Brooklyn, N. Y.
L. Kronenberg & Co., Cleveland.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Lincoln Manufacturing Co., Detroit.
Frankel Light Co., Cleveland.
Duplex Lighting Works of General Electric Co., New York City.
MacBeth Evans Glass Co., Pittsburgh.
St. Louis Brass Manufacturing Co., St. Louis.
New Era Appliance Corp., New York City.
Thomas Day Co., San Francisco.
New York Lighting Fixture Co., New York City.
Phoenix Glass Co., Pittsburgh.
Phoenix Light Co., Milwaukee.
Sulzer & Co., Inc., Philadelphia.
Moe-Bridges Co., Milwaukee.
Art Lighting Fixture Studio, Buffalo, N. Y.
Mohrlite Co., Nashville, Tenn.
Horn & Brannen Manufacturing Co., Philadelphia.
Kayline Co., Cleveland.
Beardslee Chandelier Manufacturing Co., Chicago.
Moran & Hastings Manufacturing Co., Chicago.
Morreau Co., Cleveland.
Crown Electrical Manufacturing Co., St. Charles, Ill.
Jefferson Glass Co., Follansbee, W. Va.
Holophane Glass Works of General Electric Co., New York City.
Novelty Lamp & Shade Co., Cleveland.
Falkenbach Manufacturing Co., New York City.
St. Charles Fixture Manufacturing Co., St. Charles, Ill.
Empire Lighting Fixture Co., New York City.
Virden Co., Cleveland.
Dallas Brass & Copper Co., Chicago.
E. N. Riddle Co., Toledo, O.
Max Schaffer, New York City.
Handel Co., Meriden, Conn.
Bridgeton Chandelier Co., Bridgeton, N. J.
Hocking Glass Co., Lancaster, O.
Ivanhoe Regent Works of General Electric Co., Cleveland.
Mutual Lamp Manufacturing Co., New York City.
Bauman & Loeb, New York City.
Cassidy Co., Inc., Long Island City, N. Y.
L. Plaut & Co., New York City.
Peerless Light Co., Chicago.
Eagle Manufacturing Co., Wellsburg, W. Va.
Gaites Peace & Co., Inc., Brooklyn, N. Y.
Fibredure, Inc., New York City.
C. G. Everson & Co., Chicago.
Kramer Brothers Lamp Co., New York City.
R. Williamson & Co., Chicago.
Oscar O. Friedlander, Inc., New York City.
Gillinder Brothers, Port Jarvis, N. Y.
Crown Chandelier Co., New York City.
Star Chandelier Co., Inc., New York City.
Incandescent Supply Co., New York City.
Friedley Voshardt Co., Chicago.
Acme Lighting Fixture Co., New York City.
National X-Ray Reflector Co., Chicago.
Wahle & Francois, New York City
Chicago Lamp & Fixture Co., Chicago.
Parch-O-Lite Co., Chicago.
Beatrice Irwin, New York City.
Champion Brass Works, Coldwater, Mich.
Pennsylvania Glass & Manufacturing Co., Pittsburgh.
Edward Miller & Co., Meriden, Conn.
Shapiro & Aronson, Inc., New York City.
National Metal Spinning & Stamping Co., New York City.
Robert Findlay Manufacturing Co., Inc., New York City.
Pass & Seymour, Solvay, N. Y.
Bryant Electric Co., Bridgeport, Conn.



Plan of Exhibit Space at Elmwood Music Hall, Buffalo, N. Y.

Automatic Controllers for Direct-Current Motors

Eighth of a Series of Articles on Principles and Application of Motor-Control Apparatus — Current-Limit Starting Controllers — Counter-E.M.F., Series-Relay and Lockout Types—Auxiliary Equipment

By G. J. KIRKGASSER and E. W. SEEGER

Current-Limit Automatic Starting Controllers.—These operate on the principle of definitely limiting the current taken by the motor during the starting period. They also accelerate the motor in the shortest possible time consistent with the current values for which they are adjusted. The difficulty with these controllers is that they may accelerate too rapidly on light loads and may not accelerate at all on heavy loads. The switches are usually set to close at from 110 to 125% of normal current; if the load exceeds this amount the switches will not operate and the motor accordingly runs with external resistance in circuit. As the resistors for these controllers are not designed for continuous service they may be damaged under such conditions, and for this reason current-limit controllers are not recommended for installation where the starting load of the motor is liable to be of a fluctuating character.

There are three types of current-limit starting controllers: counter-e.m.f., series relay, and series and lockout switch.

Counter-E.M.F. Type of Current-Limit Starting Controllers.—Fig. 46 shows the construction and Fig. 47 a diagram of connections for a counter-e.m.f. controller with one accelerating switch. With this type of controller the acceleration of the motor is governed by the counter e.m.f. generated by the motor. The coil *A* of the accelerating switch is connected directly across the armature terminals. The main switch *B* is closed when starting, the circuit being from the line L_1, through the main switch *B*, the armature, the series field and starting resistance, to the line L_2. The motor starts and accelerates, and as it speeds up the counter e.m.f. generated increases until the voltage value is reached for which the coil *A* is adjusted. The accelerating switch then closes, and the contacts *C* shunt out the starting resistance, allowing the motor to accelerate to full speed.

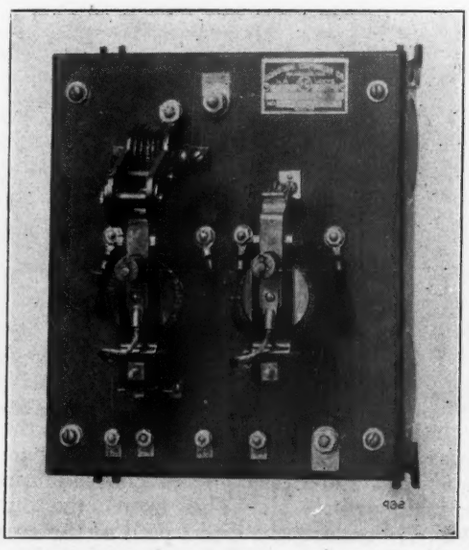


Fig. 46.
Counter-e.m.f. starting controller made by Industrial Controller Co.

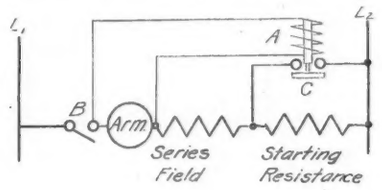


Fig. 47.
Diagram of connections for counter-e. m. f. type of starting controller.

Fig. 48 shows diagrammtically another type of counter-e.m.f. starting controller. One large magnet is used and the coil is connected across the armature as before, but instead of one resistance switch two or more are used. These switches are adjusted to close successively at different voltages as the motor speeds up.

Counter-e.m.f. controllers are sometimes preferred because of their simplicity, but they should not be used where there is a wide variation in the voltage of the power supply. On very low voltages the switches may not close, and on extremely high voltages the peak current when the last switch closes may be excessive.

The closing points of the switches of a counter-e.m.f. controller are also affected by the heating of the switch coils. As the coil heats up its resistance increases and the closing voltage will be increased.

Series-Relay Type of Current-Limit Starting Controllers.—The connections shown in Fig.

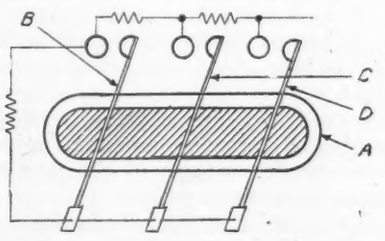


Fig. 48.
Another type of counter-e. m. f. automatic starting controller.

49 are for a compound motor with a Westinghouse three-switch control panel arranged for series-relay control. The relay-controlled switch opens whenever the motor current exceeds a predetermined value and no starting resistance is shunted out of circuit until the current decreases owing to the acceleration of the motor.

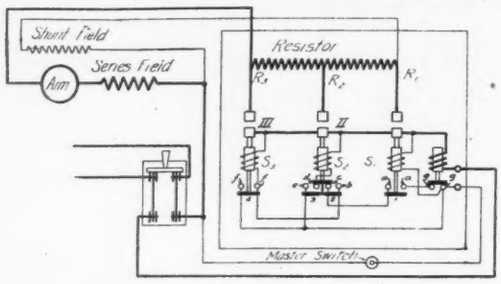


Fig. 49.
Diagram of connections for Westinghouse series-relay controller panel.

After the knife switch shown is closed the master circuit is closed, which is done in this case by operating the master push-button switch, although a float-switch or other switch could be used. Closing this circuit connects coil S_1 across the line, which causes its core to be drawn up, closing the main contacts and bridging the gap *aa* by the interlocking contact 1. The motor is thus in circuit, but with all the resistance R_3R_2 and R_2R_1 in series, and the high starting current causes the relay switch to open the gap *gg* in the control circuit. But when this current is reduced, owing to the building up of the counter e.m.f. and the acceleration of the motor to the value for which the relay has been set, the relay plunger or core drops again and gap *gg* is reclosed. The second magnet switch then operates, simultaneously closing contacts *II*, bridging gap *bc* by contact 2, opening gap *cd*, and closing gap *de* by contact 3.

Contacts *II* short-circuit the step of resistance R_2R_1, which results in an increase in the current to the motor and the relay again opens contacts *gg*. But the opening of gap *cd* and the closing of *dc* has, meanwhile, connected coil S_2 across the line so that the second switch remains closed, although in the first place its closing was controlled by the relay. Gaps *aa* and *bc* being bridged by contacts 1 and 2 respectively, the circuit through coil S_3 will be closed as soon as the motor current has decreased enough to allow the relay switch to drop its core and close the gap *gg*.

The energizing of coil S_3 causes the contacts *III* to close, shunting the other resistance step R_3R_2 and connecting the motor directly to the line. Gap *ff* is bridged by contact 4, which puts the coil S_3 beyond the control of the series relay. The starting time varies, depending upon the load on the motor.

Because of the design of this type of series relay this kind of automatic acceleration is not employed where the voltage of the power supply varies more than 12 to 15%.

The controller described above has only one series relay. The more common construction is to have one series relay for each accelerating switch. With the latter arrangement the interlock connections are not so complicated, and it is possible to get individual adjustment of the different switches.

Series-relay controllers are more satisfactory than counter-e.m.f. controllers in that they are not so much affected by voltage variations and heating of coils. The former, however, have a great many interlocking contacts which must be maintained.

Series and Lockout Automatic Starting Controllers.—In all the types of controllers which have been described the solenoids or contactors have been operated by shunt coils. In lockout and series-switch controllers the coil windings are designed to be connected directly in the motor armature circuit.

The magnetic circuits of the switches are arranged so that they hold open or lockout when the current value is high, but close when the current falls to a predetermined value. Thus, in accelerating a motor, when the circuit is first closed a high current value is obtained and the accelerating contactors are held open. As the motor speeds up the current value decreases and the first accelerating contactor closes. In closing it short-circuits a step of resistance and completes the circuit for the coil of the second accelerating contactor. When the first step of resistance is shunted out the current value increases and the second accelerating contactor is closed, and so on until all of the resistance is shunted out and the motor is up to full speed.

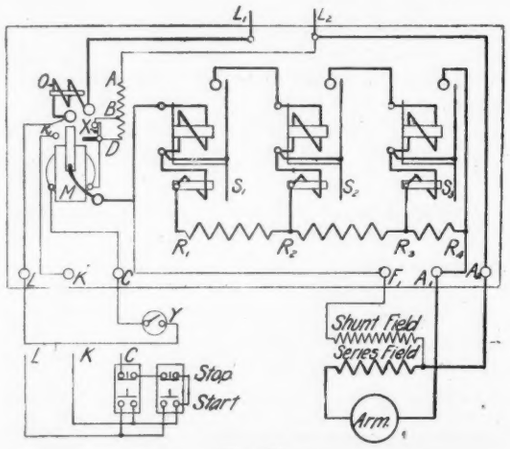


Fig. 50.
Diagram of connections for lock-out type of automatic controller.

There are a number of different types of series switches in successful operation. Fig. 50 shows typical circuit connections for a lockout type of controller. Closing the control switch *Y*, which may be a float-switch, a push-button, or a pressure regulator, a circuit is obtained through the series blowout magnet coil *O* to the terminal *L* and the switch *Y* to terminal *C*, through the shunt magnet coil operating the main magnet switch *M*, the small flipper switch *X*, and the resistance *BA* to L_2, completing the circuit to the magnet coil and causing it to close the single-pole main switch *M*. This opens the flipper switch *X*, breaking the direct path of the current through the resistance *BA* and causing the current to pass through the resistance *DB* and thence to the resistance *BA* and to the line. The cir-

cuit to the magnet coil on the switch M is not interrupted, but it has added to it the resistance BD when the switch X is opened. The addition of this resistance to the coil circuit of the main magnet switch is for the purpose of reducing the current value in this coil during the period when the switch is closed and of thus reducing the heating effect.

When the switch M is closed the path of the current is from L_1, through the blowout coil O and the two parts of the series coil of the first accelerating switch (series type) S_1, then through the resistors R_1R_2, R_2R_3 and R_3R_4, to the armature of the motor by way of the terminal A_1. From the armature the path is back to A_2 and thence to the line L_2. The shunt-field connection is made through the main switch M to F and A_2 and L_2.

Current in the first accelerating switch S_1 causes it to close when the current has dropped to the value for which the switch is adjusted to operate. The initial value of current to the armature is quickly reduced as the counter e.m.f. is built up. After the first switch closes a path is provided for the current through the "holding in" part of its coil and the two parts of the coil of the second switch S_2.

Resistor R_1R_2 and the lower part of the coil of switch S_1 are short-circuited, the shunting of the resistor allowing an increase in the value of current to the motor armature and speeding it up. When this increased speed has been reduced the current switch S_2 closes, shunting the resistor R_2R_3 and at the same time providing a circuit through the last accelerating switch S_3. When this finally closes it provides a circuit for the armature current from the main magnet switch M through the upper parts of the series accelerating switches. The motor then has full line voltage, and it at once comes up to full normal running speed.

When push-button stations with normally closed "stop" buttons and normally open "start" buttons are employed, a connection is made to the

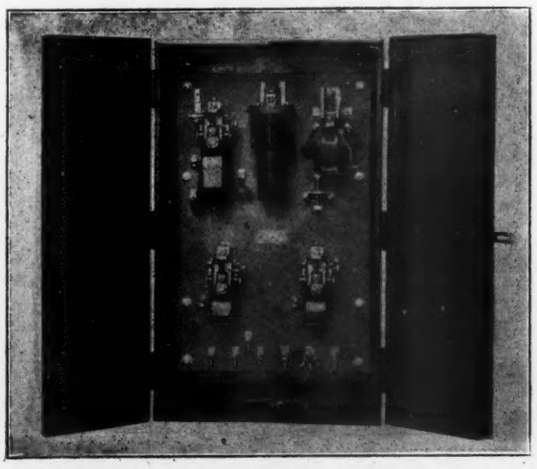


Fig. 51.

General Electric Co. series-switch automatic starting controller mounted in inclosing case.

terminal marked K, which connects to the point K_1, and closing the normally open push-button connected between the terminals L and K, as indicated by the first push-button station, completes the circuit to the operating magnet of the magnet switch M. When this switch makes contact at the point K_1 the first push-button is short-circuited so that when it is released and the circuit at that point broken a circuit to the magnet coil of the switch M is maintained through the point K_1. The normally closed "stop" buttons are connected in circuit through the magnet coil of switch M, and depressing one of these buttons breaks the circuit to the switch coil, causing it to open the motor circuit.

Series switch starters are to be preferred because of their simplicity and because practically no electrical interlocks are required. It is also a well-known fact that less trouble is experienced

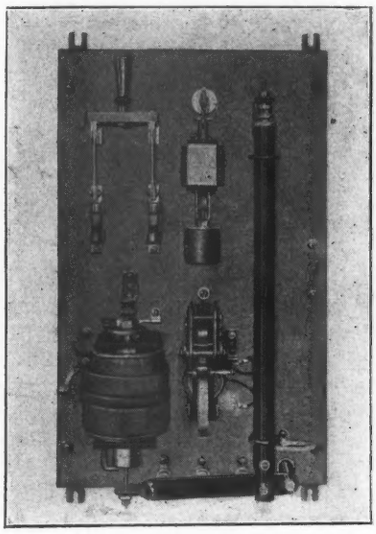


Fig. 52.

Allen-Bradley automatic starting controller with compressed-graphite disk resistor.

with series coils than with those of the shunt type. They have the additional advantage of being very easy to adjust for actual load conditions. They have the limitation, however, common to all current-limit controllers, that they may accelerate the motor too rapidly on light load and fail to accelerate on heavy loads.

Series switches cannot be used where multi-speed master control is desired. It is, of course, possible to provide each switch with a closing coil of the shunt type, but this usually necessitates the use of electrical interlocks.

Automatic Starting Controllers With Dynamic Braking.—The automatic controllers which have been described are used simply to start, accelerate and stop the motors with which they are used. It is possible, however, to use additional apparatus with any of the types described and obtain other features of control. Dynamic braking is frequently required in connection with automatic controllers and can be obtained in several different ways.

If the controller is equipped with a magnetic main switch the simplest method is to put a "down" contact on the main switch which connects the dynamic-braking resistance across the armature terminals in the "off" position of the controller.

Another common method is to use a separate normally open contactor for the dynamic-brak-

ing circuit. The operating coil of the contactor is connected across the armature terminals in the "off" position of the controller and the counter e.m.f. causes the contactor to close and connect the braking resistance. When the motor stops the counter e.m.f. becomes zero, and the contactor drops out, which results in disconnecting the resistance.

In other cases a separate spring-closed contactor is used. This is arranged to close a circuit when its coil is de-energized. The coil is therefore energized while the motor is running and when the motor stops the coil circuit is opened and the spring causes the contactor to close and completes the dynamic-braking circuit.

Reversing Automatic Controllers.—There are two general types of reversing automatic controllers—those which consist of a manual reverse switch with an automatic controller, and those where the controller is entirely magnetic.

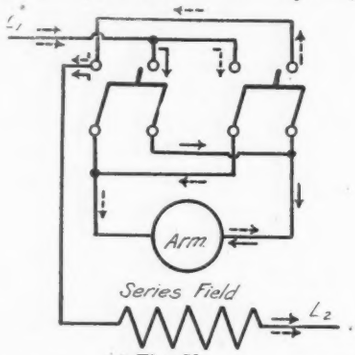


Fig. 53.
Diagram of connections to indicate method of reversing a direct-current motor.

Manual reverse switches are used quite frequently for slow-speed freight-elevator service. They are also used for some classes of machine-tool service and for practically all small reversing equipments where the operation is infrequent.

Magnetic reversing switches are used for passenger-elevator service, mill controllers and on nearly all equipment which must be reversed frequently.

The magnetic reversing switch usually consists of two double-pole single-throw contactors which are interlocked mechanically so that only one contactor may be in circuit at a time. The usual connections for reversing are shown in Fig. 53. The full-line arrows indicate the path of the current when the forward contactor is closed and the dotted lines indicate the path when the reverse switch is closed.

Auxiliary Speed Control in Connection With Automatic Starting Controllers.—Speed control of motors through changing the field strength is obtained in connection with automatic starting controllers in a number of different ways. If only 10 or 15% increase in speed is required it is usually satisfactory simply to connect a rheostat in series with the field and allow the motor to accelerate with the rheostat set in any position.

Although some motors commutate properly when starting with a weakened field, it is usually necessary if the speed increase is more than 25% to start with full field strength and insert resistance in the field circuit after the motor is up to normal speed. In some cases this result is attained by providing additional contacts on the automatic starting controller which insert the resistance in the field circuit after the armature resistance is all short-circuited.

On other controllers separate magnetic switches are provided for inserting resistance in the field circuit, and the circuits are arranged so that these switches do not operate until the motor has attained normal speed.

If a motor has solid field poles or if the fields are provided with dampening windings, it is sometimes possible to obtain an increase of 100% or more in speed in one step and still not obtain an objectionably high armature-current value. With laminated field poles, however, the field responds much quicker, and provision must be made for weakening the field gradually or excessive armature current will be obtained.

Probably the most common method of limiting the armature current while accelerating is by use of a vibrating relay. Fig. 54 shows one method of using this type of relay, which is provided with a starting coil and a running coil. During the starting period the path of the current is through both of these coils, and the relay is held closed, thus insuring that the motor starts with full field strength. When the last accelerating switch closes it not only shunts the last step of armature resistance but also short-circuits the starting coil of the relay. As soon as the current falls to a value a little above the full-load current of the motor this relay drops out and inserts resistance in the field circuit. Weakening the field causes an increase of current value in the armature circuit, and the motor accelerates. The increase in current, however, causes the relay to close, and it will stay closed until the armature current falls to the value for which the relay is set. The relay continues to open and close or vibrate in this way until the motor is up to speed.

It is also necessary in some cases to limit the armature current during deceleration. Suppose, for instance, a motor is operating with a weakened field at 200% above normal speed, and the field is suddenly strengthened to its full value. The motor will for a short time continue to run at approximately three times normal speed, and since the field is strengthened the counter e.m.f. of the motor will be much higher than the line voltage and a high reverse current in the motor will result. A normally closed vibrating relay is sometimes used to prevent this reverse current from becoming excessive. The relay is adjusted to operate on a low reverse current and insert resistance in the field circuit, in this way checking the high counter e.m.f. which causes the reversal of current.

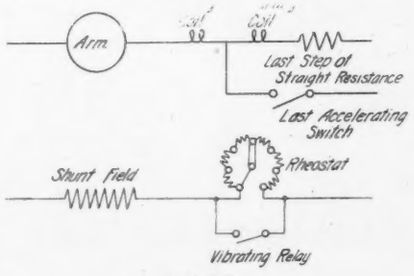


Fig. 54.
Schematic diagram showing use of a vibrating relay.

(To Be Continued.)

EDITORIAL COMMENT

Industrial Relations in Utilities

The establishment of an industrial relations department in the organization of the Commonwealth Edison Co. of Chicago marks a new development of more than passing interest to the central-station industry and the public at large. The new department, under the direction of a competent manager reporting directly to the president of the company, will have jurisdiction over employment and the various common interests of the company and its employes. Health, safety, education, welfare and employe-management relations come under the supervision of the new department.

Industrial relations departments established in certain manufacturing plants have already accomplished such noteworthy results as to fully justify their continuation and the broadening of their scope of influence. The inauguration of an industrial relations department in a great public utility, it is to be hoped, will prove as successful and as beneficial as such activities have been in industry.

Employment departments have done good work, but there are many problems with which such a department would not be fitted to deal. A medical department has its plans, but there are many industrial relations with which such a department has no real concern. The throwing together of these two important departments, with all other departments and divisions interested or related and providing the facilities for expansion of existing activities and the creation of new ones should result in the formation of a new agency of great possibilities. Public utilities depend upon the faithfulness of their employes for continuity and quality of service rendered, and the general public depends upon the utilities and the services which they render for such a vast array of conveniences and necessities that the breakdown of a utility would be a real calamity to the community which it serves. Anything which will serve to bring the management and employes of great utility properties into closer relation will work to the benefit of both, and, in the end, for the vastly greater benefit of the public.

While it is not possible to predict what influence this new department may have in this individual case, or what may grow out of it in the industry, it is certain that almost unlimited opportunities are at hand. The company and its employes are to be congratulated on the move that has now been inaugurated in their mutual interests. The industry will undoubtedly watch this new development with keen interest, and expand or modify the original movement as experience dictates and as conditions require.

An Important Decision

The International Association of Machinists called a strike against the Duplex Printing Press Co. because the latter declined to recognize the "closed shop." The machinists attempted further to enforce their labor policy by refusing to permit the setting up of Duplex presses throughout the country. The company asserted that this action was contrary to the Sherman law, since it was clearly in restraint of trade. The machinists claimed immunity from the Sherman law under the Clayton act.

This case has an important bearing not only upon printing machinery but also upon power and electrical equipment, inasmuch as the sale and use of the latter might be nullified in any community, and has, in fact, been many times hampered by the refusal of union workmen to handle material coming from a manufacturer at whose plant a strike has been called.

By a majority decision, the Supreme Court has upheld the contention of the company. It declares the Clayton law does not free labor unions from liability to injunction against interference with the interstate trade of employers. The machinists must abandon their boycott upon the products of the Duplex company.

This decision may have vital bearing upon many similar situations which are to be found throughout the country. It will be recalled by many of our readers in the Central West that the effort to ameliorate the critical condition of Chicago's housing problem by the erection of ready-made houses manufactured in another state was prevented by the refusal of Chicago union labor to permit the setting up of the framework. Similar interference in restraint of trade has been reported in many other parts of the country. Labor has been working on the theory that under the Clayton law it was privileged to exercise the power of combination in ways denied to other interests. The Supreme Court says such privilege does not exist, but it does not exempt them from restrictions the Sherman law imposes.

No law designed for the good of the community can permit the use of such methods in industrial controversy as may result in the destruction of the community's rights and liberties.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

TO DISCUSS TRANSFORMER VAULTS, GROUNDING, ETC.

Electric Fixtures Also to Be Considered at Detroit Meeting of Western Association of Electrical Inspectors.

Wholesale power purchasers have introduced a number of electrical hazards. The high-voltage motor has tended to reduce heavy current hazards, but has increased high-voltage dangers, and the introduction of the transformer of large size for the purpose of stepping down currents of high potential to a voltage that is practicable for use in plants makes it necessary to take care of the fire hazard involved in the large amount of oil which most of these transformers require for insulating and cooling purposes. The location of the inclosure or vault, its construction along safety lines without introducing excessive costs, the provision for suitable ventilation and drainage and the installation within this inclosure of the necessary control and protective equipment will be discussed by the inspectors and public utility representatives at the Detroit meeting of the Western Association of Electrical Inspectors to be held at the Statler Hotel, Jan. 25-28.

The National Electrical Code covers the matter in a general way but does not seem to provide sufficient detailed information. One of the problems which confronts the inspector is: "When is a substation?" It is expected that much clearer views will prevail as a result of the exchange of ideas with central-station men. It is desirable to establish a definite standard for transformer vault construction and equipment for the use of wholesale users of electric service.

Inspectors are considerably interested in the new grounding rules contained in the 1920 edition of the National Electrical Code and there is abundant evidence that this subject needs further and careful study. The importance of preserving the safety of the public is becoming more apparent. It will surprise many to know that the grounding of transformer secondaries as a safeguard against the danger of high voltage on secondary systems was discovered and applied by the pioneers who developed the alternating-current system. The Western Association of Electrical Inspectors believes that a better understanding of the grounding rules will lead to a more uniform application of them and is working to this end.

The electric fixture was one of the most prolific causes of electrical troubles in the average electrical equipment. Inspectors have long felt that the standard of construction in connection with the manufacture of fixtures should be raised, and the manufacturers have agreed that this would be wise but have seemingly been unable to bring it about. No one seems to be satisfied with the present electric fixture except those used in connection with indirect and semi-indirect lighting systems. It is expected that a discussion of the various problems involved in the construction, installation and operation of electric fixtures will lead to a better understanding in manufacturing, merchandising and inspection circles. The grounding of fixtures is now permitted under certain conditions and these will be presented during the discussion of the fixture problem.

COMMERCIAL SECTION COMMITTEES, N. E. L. A., MEET.

Various committees and bureaus of the Commercial Section, National Electric Light Association, including the lighting sales bureau, power sales bureau, advertising and publicity service bureau, electrical salesmen's handbook committee, newspaper advertising campaigns division, electric vehicle bureau, merchandise sales bureau, wiring committee, compensation of salesmen committee, education committee, commercial service and relations with customers committee, and the executive committee, held conferences in Chicago Jan. 10 and 11 at the Sherman Hotel.

On Tuesday evening an informal dinner and entertainment was extended by the Edison Electric Appliance Co. to representatives of the National Electric Light Association and the Associated Manufacturers of Electrical Supplies. President George A. Hughes, of the Edison company; M. S. Seelman, Brooklyn Edison Co.; George Baily, Westinghouse Electric & Manufacturing Co., and Mr. Levore, Pettingell-Andrews Co., Boston, were among the speakers.

FOUR ORGANIZATIONS TO MEET IN PHILADELPHIA.

Hydroelectric Power Development and Distribution Problems to Be Discussed at Joint Meeting of Engineering Societies Next Week.

A symposium on hydroelectric power and distribution will be the feature of a meeting Jan. 21 under the auspices of the Engineers' Club of Philadelphia and the Philadelphia Section of the American Society of Civil Engineers, the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

The program of the meeting includes illustrated talks on "The Modern Hydraulic Turbine," by Frank H. Rogers, hydraulic engineer of the I. P. Morris Department, William Cramp & Sons Ship & Engine Building Co.; "The Present Trend of Hydraulic Turbine Development," by Lewis F. Moody, consulting engineer of the same company; "The Application of a New Method of Water Measurement in the Efficiency Tests of the 37,500-Hp. Turbines of the Niagara Falls Power Co.," by Norman R. Gibson, hydraulic engineer of the Niagara Falls (N. Y.) Power Co.; "Surges in Conduits and Other Hydraulic

Problems," by Raymond D. Johnson, consulting engineer, New York City; "Niagara Falls Power Development and Its Products in Philadelphia," by John L. Harper, vice-president and chief engineer of the Niagara Falls Power Co., and "Electrical Features of Hydroelectric Power," by David B. Rushmore, chief engineer of the power and mining department, General electric Co., Schenectady, N. Y.

During Mr. Harper's address colored moving pictures will be shown covering the power house equipment at Niagara, scenic views of the falls, together with construction views of the new 100,000-hp. extension and the erection of the world's largest hydroelectric units.

CONTRACTOR-DEALERS OF IOWA TO DISCUSS CO-OPERATION.

The principal subjects to be discussed at the meeting of the Iowa State Association of Electrical Contractor-Dealers to be held Jan. 26-27 in Davenport, Ia., will be estimating work, advertising, better bookkeeping and accounting, proper display of merchandise, and co-operation of the manufacturers, dealers and lighting companies toward future development of the field. The business sessions will be held at the Blackhawk Hotel.

The committees in charge of the convention, together with the names of the chairman of each, are as follows: General, Louis L. Corry; program, Edward M. Kunkel; publicity, Louis L. Corry; finance, R. L. Stiles; register and accommodations, F. Thomas Turner, and entertainment, Forrest E. Downing.

N. A. E. C. D. SPECIAL AGENT TO TOUR WESTERN STATES.

Meetings of local electrical contractor-dealers have been arranged in the chief cities of the western and southern states by General Manager W. H. Morton of the National Association of Electrical Contractors and Dealers. Each of these meetings will be attended by Laurence W. Davis, special representative of the association, who will address the contractor-dealers in the interest of organization and co-operation. Mr. Davis' itinerary includes 25 cities, starting at Lincoln, Neb., Jan. 11. The schedule calls for one meeting in each city except San Francisco, where a noon and evening meeting are scheduled for Feb. 7 and 9 respectively.

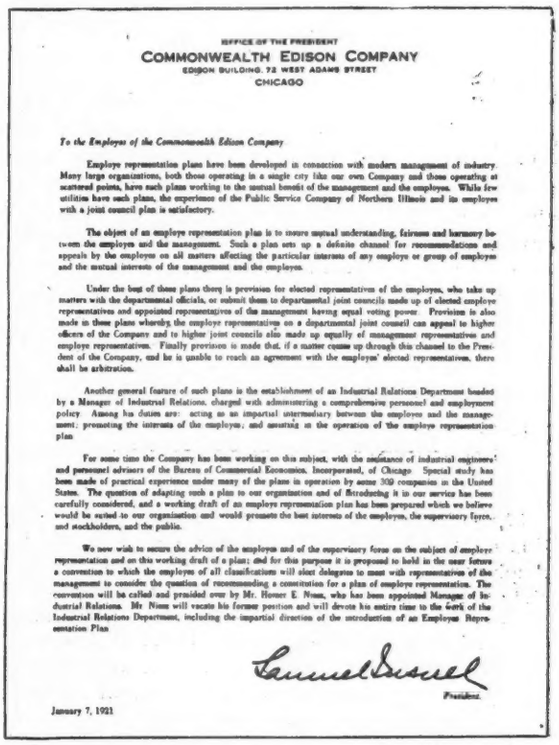
DECISION ON SERVICE CONNECTION CHARGES.

The Public Service Commission of Pennsylvania has sustained a complaint made by a resident of Ashland against the Eastern Pennsylvania Light, Heat & Power Co., in its rule requiring a deposit of $25 each for properties before installing service. In its decision the commission says: "An electric company is not justified in demanding that a prospective consumer supply capital for the labor and material required to make a service connection. * * * The rule requiring a deposit of the amount noted is clearly a demand on the part of the company requiring the prospective consumer to finance a service connection. The service line of an electric company to the point of connection just outside the building of the consumer should be the property of and installed by the company at its expense."

UTILITY ESTABLISHES INDUSTRIAL RELATIONS DEPARTMENT.

Commonwealth Edison Co. Adopts Employe Representative Plan to Develop Personnel and Employment Policy in Company Service.

Another example of the progressiveness of the Commonwealth Edison Co., Chicago, one of the largest central-station companies in the world, is the establishment of an industrial relations department. The company has been investigating for some time a plan for employe representation with the object of insuring mutual understanding, fairness and harmony between the employes and the



OFFICE OF THE PRESIDENT
COMMONWEALTH EDISON COMPANY
EDISON BUILDING, 72 WEST ADAMS STREET
CHICAGO

To the Employes of the Commonwealth Edison Company

Employe representation plans have been developed in connection with modern management of industry. Many large organizations, both those operating in a single city like our own Company and those operating at scattered points, have such plans working to the mutual benefit of the management and the employes. While few utilities have such plans, the experience of the Public Service Company of Northern Illinois and its employes with a joint council plan is satisfactory.

The object of an employe representation plan is to insure mutual understanding, fairness and harmony between the employes and the management. Such a plan sets up a definite channel for recommendations and appeals by the employes on all matters affecting the particular interests of any employe or group of employes and the mutual interests of the management and the employes.

Under the best of these plans there is provision for elected representatives of the employes, who take up matters with the departmental officials, or submit them to departmental joint councils made up of elected employe representatives and appointed representatives of the management having equal voting power. Provision is also made in these plans whereby the employe representatives on a departmental joint council can appeal to higher officers of the Company and to higher joint councils also made up equally of management representatives and employe representatives. Finally provision is made that, if a matter comes up through this channel to the President of the Company, and he is unable to reach an agreement with the employes' elected representatives, there shall be arbitration.

Another general feature of such plans is the establishment of an Industrial Relations Department headed by a Manager of Industrial Relations, charged with administering a comprehensive personnel and employment policy. Among his duties are: acting as an impartial intermediary between the employes and the management; promoting the interests of the employes; and assuring in the operation of the employe representation plan.

For some time the Company has been working on this subject, with the assistance of industrial engineers and personnel advisers of the Bureau of Commercial Economics, Incorporated, of Chicago. Special study has been made of practical experience under many of the plans in operation by some 300 companies in the United States. The question of adapting such a plan to our organization and of introducing it in our service has been carefully considered, and a working draft of an employe representation plan has been prepared which we believe would be suited to our organization and would promote the best interests of the employes, the supervisory force, and stockholders, and the public.

We now wish to secure the advice of the employes and of the supervisory force on the subject of employe representation and on this working draft of a plan; and for this purpose it is proposed to hold in the near future a convention to which the employes of all classifications will elect delegates to meet with representatives of the management to consider the question of recommending a constitution for a plan of employe representation. The convention will be called and presided over by Mr. Homer E. Niesz, who has been appointed Manager of Industrial Relations. Mr. Niesz will vacate his former position and will devote his entire time to the work of the Industrial Relations Department, including the impartial direction of the introduction of an Employes Representation Plan.

Samuel Insull
President.

January 7, 1921

Announcement of Representative Plan Sent to Employes of Commonwealth Edison Co.

management. The result of this study has been announced by Samuel Insull, president of the company, through the creation of an industrial relations department, headed by Homer E. Niesz as manager.

One of the general duties of the department will be to supervise in an impartial manner, as between the management and the employes, the development, introduction and operation of an employes' representative plan. The manager of industrial relations will have the administrative responsibility for developing and carrying out a comprehensive personnel and employment policy in the company service, and for the management of the units of the company organization performing functions of personnel administration. The position of dean of women in the department

of industrial relations has also been created, the duties of which will be to promote the well-being and the representation of the women employes.

The organization of the industrial relations department marks another step in central-station company management, and the fact that so prominent a factor in the industry as the Commonwealth Edison Co. has seen fit to create such a department will doubtless induce others to inaugurate such a plan. Employe representation plans have been developed in connection with modern management of industry, and many large organizations, including those operating in a single city and those operating at scattered points, have such plans working to the mutual benefit of the management and the employes.

ELECTRICAL EXPOSITION PLANNED FOR KANSAS CITY.

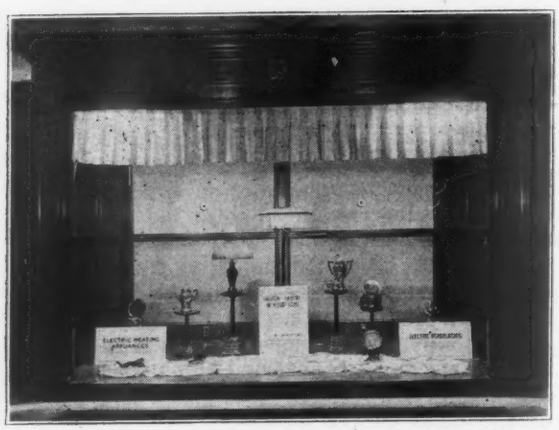
The executive committee of the Electrical Trades Exposition Co., which will hold an electrical show in Kansas City, Mo., in March, is going ahead with its plans, which aim to feature the educational side of the industry. Arrangements are being made for a model electrical home, where the domestic science departments of the local schools will conduct demonstrations with electric cooking devices. It is also proposed to have a lighting demonstration to show what can be accomplished by various illumination systems.

GENERAL ELECTRIC MERCHANDISING EXHIBITS OPEN.

Electrical Jobbers and Contractor-Dealers to See Demonstrations of Lighting and Appliance Displays at Local Conferences.

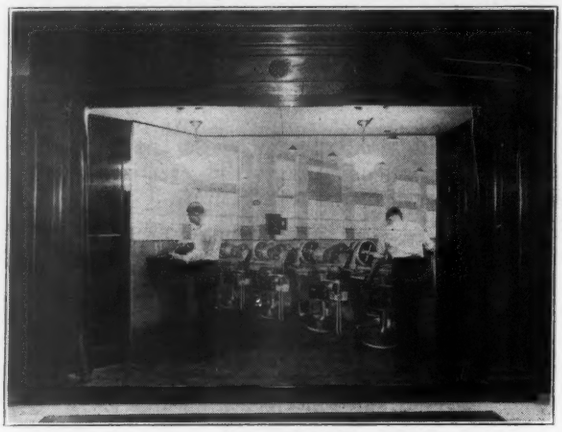
Optimism regarding the business conditions in this country during the coming year is strongly displayed by the General Electric Co. in its elaborate and interesting merchandising conference planned for 1921, to present to the jobbers and retail dealers in a concise and impressive manner data pertaining to its electrical products.

This conference, which will be conducted by 15 to 20 men representing the General Electric and associated companies, will cover a period of more than four months, during which a tour from coast to coast will be made with stops of two or more days in about 40 of the large cities of the United States.



One of the Miniature Window Displays of General Electric Merchandising Exhibit.

The initial meetings of the conference were held at the headquarters of the Public Service Corp., Newark, N. J., Jan. 10, and subsequent meetings the remaining days this week took place in the auditorium of the New York Edison Co., New York City. The chief feature of the conference is a specially constructed revolving stage, 12 ft. in diameter, which occupies a floor space approximately 14 by 12 ft. and nearly 12 ft. high. The front is so built as to form the usual proscenium arch of a stage, and the revolving stage is divided into quarters by four wings radiating from the center. The upper half of each wing is separate and revolves independent of the lower part, thus permitting different upper and lower sections to be combined.



Stage Scene of General Electric Exhibit Showing Properly Equipped Machine Shop.

One of the exhibits at the Newark show was a miniature show window, 42 in. long, 31 in. high and 21 in. deep, fully dressed with miniature reproductions of electrical appliances. Another exhibit was an industrial lighting display in which were shown four miniature machine shops. The first represented an old-style shop with dark surroundings resulting in glare, multiplicity of shadows, high accident hazard and low production. The next, showing a step in the right direction, gave low intensity and general illumination, supplemented by individual lamps for each machine unit. The third model, entitled "Caution," depicted an efficient but not effective installation. Lamps were of too high wattage, resulting in uneven lighting with dense shadows and many machines receiving the light from the wrong direction. The fourth model showed a modern machine shop with high intensity and diffused general illumination. Mounted upon the entire display was a chart showing comparative lamp and illumination data.

The following representatives participated in the Newark and New York City conferences: Representing Edison Lamp Works, A. D. Page, G. C. Osborn, T. J. McManis, A. L. Powell and R. E. Harrington; merchandising bureau, Kolin Hagar; supply department, W. D. Yates and J. O. Wetherbie; Sprague Electric Works, H. N. Knoderer and H. B. Kirkland; Ivanhoe Regent Works, J. M. Smith; Duplex Lighting Works,

G. P. Norton; Hurley Machine Co., J. T. Casey.

After leaving New York the conference moves to Philadelphia, where meetings will be held at the Hotel Continental, Jan. 19-20, following which the present itinerary calls for stops in Baltimore, Pittsburgh, Columbus, Cleveland, Toledo, Buffalo and Schenectady. The second itinerary begins at Washington, D. C., Feb. 15, and extends to New Orleans, closing at Cincinnati. The third trip will extend from Boston to the Pacific Coast.

ELECTRICAL PERMITS ISSUED BY NEW JERSEY BUREAU.

The electrical bureau of the building department, Newark, N. J., of which Ralph B. Ward is chief, has issued a statement in connection with its annual report, setting forth that 8057 electrical permits were issued by the bureau in 1920, as against 7042 in the preceding year, an increase of 1015. The number of inspections totaled 22,968, as compared with 17,701 in 1919, an increase of 5268, giving an indication in the growth in wiring installations and the use of electrical service. The fees during 1920 were $21,838.91, as against $13,567.16 in the previous year. The 1920 receipts entirely covered the cost of operation of the bureau, making it self-supporting for the first time.

BRITISH ILLUMINATING ENGINEERS HOLD MEETING.

Industrial Lighting in Relation to Health and Safety Discussed by Illuminating Engineering Society in London Meeting Last Month.

An interesting account of the progress in illuminating engineering was given at the meeting of the Illuminating Engineering Society held in London, Eng., Dec. 14. A paper on "Industrial Lighting in Relation to Health and Safety," was read by L. Gaster, who pointed out the desirability of international agreement on the principles of industrial lighting for ultimate application in an international code on factory lighting. The International Labor Office of the League of Nations in Geneva is interesting itself, through its section on industrial hygiene, in the question of factory lighting.

Much attention has also been given to industrial lighting as an aid to safety, notably at the first conference organized by the British Industrial Safety First Congress held in London last September. A committee has been formed under the Ministry of Health to inquire into the causes of blindness and defective vision, and it is hoped that inadequate lighting will receive attention as one of the contributory causes of such eyesight trouble. The society has also appointed a new committee to deal with the measurement of light and illumination, which it is expected will serve as a permanent source of information to which problems arising in connection with contracts involving the specification of candlepower or illumination may be referred.

The committee on electric lamps and lighting appliances reported considerable progress during the past year, supplies of lamps having notably increased. Fittings suitable for use with the smaller gas-filled lamps have been introduced. Some small gas-filled lamps, with opal bulbs, were exhibited by the Edison Swan Electric Co., Ltd. J. S. Dow showed two small 220-volt neon lamps which are still in the experimental stage. They can be inserted into an ordinary lamp circuit and resemble a small gas-filled lamp in general appearance. The light, however, is not derived from a filament but from an electrical discharge through rarified neon gas, the light appearing as a soft orange glow.

A. Cunningham, lighting engineer to the London and Southwestern railway, described a new method of lighting railway time-tables in use at Waterloo station. The time-tables are pasted on inclined sheets of glass forming a double-inclined rack, which is lighted from within by transmitted light, rendering the figures perfectly legible without any inconvenient shadows being cast by the observers' bodies.

SCOPE OF COLORADO RIVER POWER PROJECT OUTLINED.

Hydroelectric Developments Planned by Southern California Edison Co. to Cover Eight States—Diversified Uses for Energy Produced.

Further details concerning the scope of the extensive hydroelectric project of the Southern California Edison Co., whereby it is proposed to develop 2,500,000 hp. of electrical energy from sites on the Colorado river outside of the National Park, indicate that in the development of water power of the Colorado river the installations must be made in large units and at such intervals as the demand for power will justify additions of from 100,000 to 200,000 hp. Development in small units would involve greater cost

Area of Southern California Edison Power Project. Circles Indicate Distances in Miles from Approximate Center of Generation.

per horsepower, resulting in higher charges to consumers.

Such developments can be made at low cost only by some organization having a well-established business in the electrical field with ample facilities for the distribution of electrical energy in large quantities, coupled with diversified use. The rapid increase in demand for electric power for municipal, agricultural, mining, industrial and railway uses is not confined to Southern Cali-

fornia, but extends to Arizona, New Mexico, Utah, Colorado, Wyoming, Idaho and Nevada. It is admitted that the development of these states has been greatly retarded by their inability to secure power at reasonable cost, owing both to the constantly increasing price of fuel and the high capital cost of water-power developments where diversity of use is not possible. Diversity means the wide range of uses for power which will enable the output to be marketed on a continuous basis with a resultant increase in revenue, permitting lower rates to consumers.

It is estimated that Arizona, New Mexico, Utah and Nevada will in the near future absorb about 500,000 hp., which can be produced from the Colorado river project at an extremely low cost when combined with the larger requirements of California. Electrification of transcontinental railroads, or the major part thereof, is no longer a visionary dream, but has become an established fact by the successful application of electrical equipment to some of the principal railroads in the Northwest, notably the Chicago, Milwaukee & St. Paul Railroad. It may, therefore, be reasonably presumed that with the increasing cost of fuel, cheap electrical energy will be adopted as the prime mover and substituted for the more expensive methods now utilized on our transcontinental railroads.

WILL LAND SUBMARINE TELEPHONE CABLE AT KEY WEST.

The Cuban-American Telephone & Telegraph Co., Havana, Cuba, has been granted permission by the Department of State, Washington, D. C., for the landing of three telephone cables at Key West, Fla. It is expected to complete the installation of the lines early in the spring; they will be about 100 miles in length, or longer than any submarine telephone cable yet laid. Three talking circuits will be provided for direct communication with the United States. One will be used for long-distance service to New York and vicinity, the other will pass through Jacksonville, Fla., and the third will be used for exchange service with Key West and other southern points.

BIRMINGHAM SECTION, A. I. S. E. E., TO MEET.

The Birmingham Section of the Association of Iron and Steel Electrical Engineers will meet Jan. 27. W. V. Dunn, chief electrician of the Tennessee Coal, Iron & Railroad Co., Fairfield, Ala., will present a paper on "Alternating Current in By-Product Plants," while E. R. Winters, chief electrician of the Woodward (Ala.) Iron Co. will speak on "Direct Current in By-Product Plants."

TO HOLD ELECTRIC VEHICLE SHOW IN NEW YORK CITY.

Arrangements for an unusual electric automobile display to be held this winter are being made by the New York Edison Co. The big show room of the company at Irving place and Fifteenth street has been set aside for the purpose, and manufacturers of electric trucks, industrial trucks, passenger cars, and batteries and accessories have been invited to exhibit their products.

Street trucks and passenger cars will be shown during the week of Jan. 29-Feb. 5, while industrial trucks will be exhibited during the following week. Batteries and accessories will be on display during the two weeks.

The show will be given under the auspices of the New York Edison Co., Charles R. Skinner, Jr., of the automobile bureau, being in charge of the arrangements.

LOCAL EDISON SECTION, N. E. L. A., ELECTS OFFICERS.

At a meeting held Jan. 6 the Commonwealth Edison Co. (Chicago) Section of the National Electric Light Association elected the following officers for 1921: Chairman, D. D. Higgins; vice-chairman, F. X. Mettenet, and secretary, H. R. Coffey. The section is composed of about 200 Edisonians who are active in the affairs of the N. E. L. A.

COMING CONVENTIONS.

Ohio State Association of Electrical Contractor-Dealers. Meeting with Electrical League of Canton, O., Jan. 17-18.

Wisconsin State Association of Electrical Contractors and Dealers. Meeting in Milwaukee, Jan. 19-20. Secretary, John C. Piepkorn, 108 Sycamore street, Milwaukee.

Iowa Engineering Society. Annual meeting, Des Moines, Ia., Jan. 18-20. Headquarters, Hotel Chamberlain.

Associated General Contractors of America. Second national conference, New Orleans, La., Jan. 25-27. Headquarters, Hotel Grunewald. Secretary, 111 West Washington street, Chicago.

Western Association of Electrical Inspectors. Annual convention, Detroit, Mich., Jan. 25-28. Headquarters, Hotel Statler. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Iowa State Association of Electrical Contractor-Dealers. Meeting in Davenport, Ia., Jan. 26-27. Headquarters, Blackhawk Hotel. Secretary, F. Bernick, Jr., Oskaloosa, Ia.

Pennsylvania State Association of Electrical Contractors and Dealers. Annual convention, Philadelphia, Jan. 26-27. Secretary, M. G. Sellers, 1518 Sansom street, Philadelphia.

Association of Municipal Electrical Utilities of Ontario. Semi-annual convention, Toronto, Can., Jan. 27-28.

National Council of Lighting Fixture Manufacturers. Annual convention and lighting fixture market, Elmwood Music Hall, Buffalo, N. Y., Feb. 14-19. Secretary, Charles H. Hofrichter, 8410 Lake avenue, Cleveland.

American Institute of Electrical Engineers. Midwinter convention, Engineering Societies building, New York City, Feb. 16-18. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Joint meeting of Illinois State Electric Association, Illinois Electric Railways Association and Illinois Gas Association. Chicago, March 15-17. Headquarters, Sherman House. Secretary, R. V. Prather, Springfield, Ill.

National Fire Protection Association. Annual convention, San Francisco, June 14-16. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

North Central Electric Association. Annual convention, Duluth, Minn., June 14-16. Secretary, H. E. Young, 15 South Fifth street, Minneapolis, Minn.

American Institute of Electrical Engineers. Annual convention jointly with the Pacific Coast convention, Salt Lake City, Utah, June 20-25. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

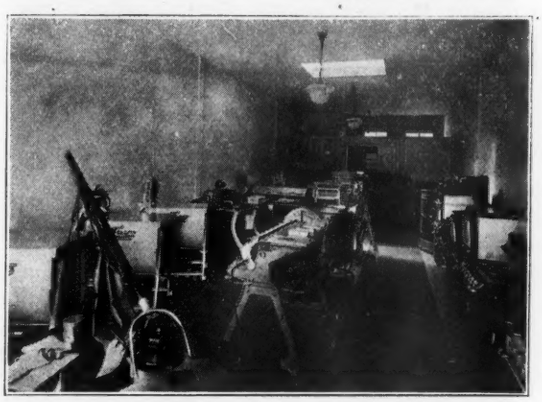
CONTRACTOR-DEALER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-keeping for the Dealer in Electrical Goods

READY SALE FOR ELECTRIC IRONER TO LARGE FAMILIES.

Manager of Branch Electric Store in Oak Park, Ill., Sells Nearly as Many Ironers as Clothes Washers in Canvass of Homes.

Last summer a small branch store for the sale of electric household appliances was established in the midst of a residential section of Oak Park,



Nearly as Many Ironing Machines as Washers Sold From This Small Electric Store.

Ill., noted for its large families, a majority of whom own their own homes. There is room in this store for the display of only a few samples of washers, ironers, vacuum cleaners and a few other appliances, but it is doing a thrifty business. It is a profitable little store.

Where the families are as large as they are in this neighborhood it is difficult to secure servants, so the advent of H. Hemmingsen, manager of the little appliance store, was warmly welcomed. Mr. Hemmingsen leaves the store in charge of a young woman while he makes house-to-house calls or follows up inquiries that come into the store. He finds a ready sale for labor-saving electrical devices, chief among which are clothes washers and ironing machines. At nearly every home where he sells an electric clothes washer he also sells an ironing machine. In nearly all of the homes where these appliances are sold the members of the family do their own household work.

WOMEN SUCCESSFUL IN SELLING ELECTRICAL APPLIANCES.

Miss Mary Ray, manager of the merchandising department for Gary Heat, Light & Power Co., Gary, Ind., is an enthusiastic member of the Indiana Association of Electrical Contractors and Dealers. She attends all meetings—often the only woman present—and is deeply interested in the methods of other electrical dealers. To her department Miss Ray applies the best methods gleaned from association meetings and observation of the displays and sales methods of other dealers.

Because of their intimate knowledge of the hopes and desires of housewives, women who enter the electrical field and undertake the demonstrating and selling of household appliances are making a success. They are accomplishing wonders in overcoming the awe or fear of the average housewife of electrical "machinery."

HOLIDAY WINDOW DISPLAY SELLS VACUUM CLEANERS.

Dealer in New York City Specializes in Display of But One Appliance for Christmas Gift With Successful Sales Results.

One cannot fully appreciate the value of the window display in the accompanying view without personal observation of the effect due to the blending of colors produced in the trim by the judicious distribution of autumn leaves and Christmas wreathes. They emphasized the importance of the appliance featured in the window as a Christmas gift, as well as a permanent household convenience.

The Manhattan Electrical Supply Co., New York City, installed and maintained this display throughout the entire holiday season of 1919 with the result that 1006 vacuum cleaners were sold.

This Holiday Window Display Sold Many Vacuum Cleaners Last Year.

While the time-payment plan was advanced as an added inducement to customers, more than 40% of the sales were on a cash basis. As a reminder of the approach of Christmas the current date of the canlendar was boldly displayed in the window from day to day.

Business Hints for the Dealer

Featuring Lamps and Fixtures in Winter Displays—Dealers Pave Way for Sale of Lighting Fixtures With Big Displays of Lamps

"An appropriate lamp for every room" should be the slogan of the electrical dealers this winter. During the short days of winter so much time must be spent indoors that it will add greatly to the comfort of the household if there are good lights in every room, and it will add much to the aesthetic value if each of these lamps is appropriate to its surroundings.

The Commonwealth Edison Co., Chicago, realizing this, has devoted a number of small windows to suggesting the appropriate lamp for a particular room. For example, a corner of a sun parlor is shown with wicker furniture, wicker stand and floor lamp with shades lined with cretonne; for a boudoir are dainty little ivory portables with shades of pink or blue silk; for the library, larger and more imposing lamps with silk shades in bright colors; for the library or den the round, parchment shade for the stand or floor lamp, and the adjustable student's lamp with the big green shade.

Many firms have largely increased their sales of lighting fixtures by first giving their attention to the sale of incandescent lamps. Window demonstrations of the utility of Mazda lamps, coupled with displays of beautiful lighting fixtures, and supplemented by newspaper and other printed publicity, will do wonders towards increasing the sale of this widely used lamp.

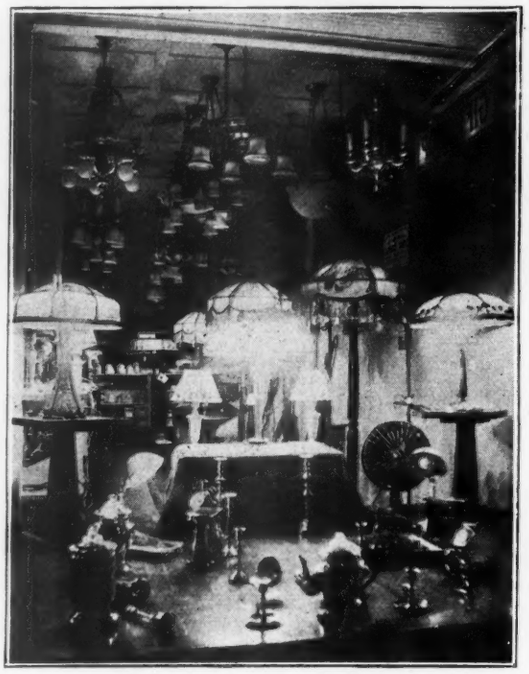
The Wahlgren Electric Co., Everett, Wash., had printed a business card on which the design of a nickel coin stood out very prominently. This card read:

FOR FIVE CENTS.

The price of a street-car ride in the good old days, you can light an average room with Edison Mazda lamps three hours a night for six nights. Expert advice on residence, store and shop lighting will be cheerfully furnished by specialists on application to us.

On the opposite side was a complete list of all sizes and specifications of Mazda lamps, with the price of each, singly or in quantities. At the entrance to the Wahlgren store was a table on which rested a smaller table holding a row of lights, the latter table being subjected to constant agitation. A card attached to the big table read: "The lamp that stands the jar." Inside the store, above the shelves devoted to electrical merchandise, were a number of boxes lined with blue, in which were shown different types of lighting fixtures, each box being illuminated by lamps set in the top and throwing their rays directly on the fixtures. To each box was attached a card containing the price of the fixture complete, and the number of lamps it required.

Lamp Display in Window of Wahlgren Electrical Co., Everett, Wash.



Lamp and Fixture Display of S. C. Irby Co., Jackson, Miss.

Illustrating Lighting Economy of Electric Lamp.

Another firm that featured the Mazda lamp for both durability and economy was the Chattanooga Light & Power Co., Chattanooga, Tenn. Its window display was decidedly compelling as it showed a balance scale of red, 8 ft. in length. The base was composed of a number of Mazda lamp boxes, and the cross-arms were long, light pieces of lath with cards suspended from them, on which were printed: "Kill the cost of current." The scale plates were of paper pulp, suspended from the beam by red ribbons. In one plate was a Mazda lamp beneath which was a card: "60-watt Mazda lamp gives 60-candle power" and in the other plate an ordinary carbon lamp and a card reading: "60-watt carbon lamp gives 20-candle power."

An especially striking illustration of the superiority of the Mazda as a lighting medium was

shown down in front where there, at one side, was a big frame with 60 sockets in each of which was a long wax taper. At the other side was a frame holding 20 candles. Ribbons ran from the Mazda lamp to the long frame, and from the carbon lamp to the small frame, while a card on which was a large interrogation point querried, "Which do you use?" Their window advertising was backed with some very effective newspaper publicity. A quarter-page advertisement was surrounded with an outline facsimile of a Mazda lamp, and the entire advertisement was given over to lamps, as follows:

MAZDA LAMPS GIVE MORE AND BETTER LIGHT AT LESS OPERATING COST.

Replace worn out lamps with Mazda quality lamps—There is a Mazda lamp for every purpose —home, office, store and window lighting.
Order them by the box—It's cheaper.

Back of the counter in the lamp department was an arch on which were suspended a number of the blue and frosted globes, and a card suggested:

Use one Mazda lamp where it was necessary to use two carbon lamps.
Cut your light bill in half,—the Mazda will do this, and more.

Circulars were printed, captioned: "Mazda lamps are a real economy. Save the eyesight; triple the light; buy them by the carton."

This was followed by a detailed statement of all the lamps carried, with the prices of each. One of these leaflets was handed to each customer and wrapped with each package that left the store. Thus the name and the fame of the white light was carried into homes in every part of the city.

When all is said, however, there is no publicity agent like the show window, and the Wahlgren Electrical Co. arranged a very effective one to complement its other advertising. The company made good use of dealer helps, as the background of its window was hung with Mazda lithographs and cutouts. The floor was composed of large black and white checked cardboard, and on this were placed a number of fluted red, white and blue lamp shades. In the background were boxes of the lamps, and in the center, set in brass sockets, were a number of the Mazda lamps of different sizes. This display was made more attractive by effective lighting.

Not only lamps, but all sorts of portables and fixtures should be advertised at the same time. The S. C. Irby Co., Jackson, Miss., had an entire lamp room partitioned off from the main sales room. It was a long, narrow room with a blackless window at one end, permitting those who passed a full view of the department. From the ceiling were suspended fixtures for all rooms, and on pedestals of polished wood were placed lamps with shades of art glass and parchment, while mingled with these were tall floor lamps. On a mound covered with green velvet were shown portable electric lamps.

At one time an entire window display was made with this latter type of lamp, which was featured as "The lamp of a thousand positions." On a table covered with a gold brocaded cloth were half a dozen electric lamps with brass bases and shades. Others were placed on the floor and still more were attached to the wall or glass. A large card advised:

THE LAMP OF A THOUSAND POSITIONS.

You can hang it, stick it, clamp it, or stand it. There's a soft, mellow light just where you need and want it. Ask to see it demonstrated. Just the thing for a study or den.

A black background and green floor covering offered a splendid contrast to the many brightly polished brass lamps, while in the background was a pyramid of these lamps in boxes, wrapped and tagged ready for delivery. On top of the pyramid was a cluster of lamps, lighted at night, thus calling special attention to the display.

MERCHANDISING FAILURES DUE TO LACK OF ADVERTISING.

Statistics Show That Nearly All Business Men Who Fail Do Not Advertise or Handle Nationally Popular Goods to Stimulate Trade.

Big financial agencies prove that an average of 16,000 business men fail every year in the United States. From the same source the information is acquired that 85%, or 13,600, of these concerns never advertised. The other 15% of the failures were advertisers but there was some other weakness, or combination of weaknesses, that nullified the benefits which might have been derived from advertising.

Approximately half of the failures were due to over-buying. The dealers were caught with too much stock on hand, very probably because they did not advertise. One of the surest ways of avoiding failure in business is by quick turnover that gives money with which to pay bills promptly. It is impossible to get a quick turnover unless customers are attracted to the store and to make purchases.

This does not necessarily mean that the electrical contractor-dealer must fail if he does not run big advertisements in the daily papers every day. Local newspapers are an excellent medium for use by the contractor-dealer in nearly all circumstances because most people have been educated to look for what they want in the advertising columns of the newspaper. But there are other means of advertising for the neighborhood dealer in a large city who cannot afford to buy space in the big city dailies.

Advertising generously includes all legitimate methods by which the dealer and contractor can attract favorable attention to his store or his business. There is no greater or better means of advertising for the neighborhood store of the electrical contractor-dealer in the big city than the window display. If the window display is made to attract passersby as a beacon or lighthouse guides the mariner, then the dealer has accomplished his first and most important step in advertising. But there are other necessary steps to be taken—the more steps the greater the reward in this direction.

There is the mailing list of customers and prospective customers to whom form letters and circulars should be mailed at least once a week if they are to be constant reminders of the location of the store and the desirability of its stock in trade.

QUESTIONS AND ANSWERS

All Readers Are Invited to Submit Contributions on Electrical Matters to This Department—Answers Should Be Sent Within Eight Days of Date of Publication of Question—Payment Will Be Made for All Answers Published

Questions.

No. 510.—Advisability of Holding Sales of Electrical Goods.—I have been endeavoring to learn from various sources, including jobbers, dealers, etc., the advantages to be gained by and the difficulties met with in conducting a sale or sales of electrical goods. Other merchants have sales for the purpose of raising money, reducing stock and cultivating new customers, and I want to find out if the electrical dealer can benefit by following their example. Will dealers or others in touch with the situation give their views on the subject?—W. R. B., Phoenix, Ariz.

No. 514.—Illumination of a Machine Shop.—What is the best method to employ, and what intensity in foot-candles should be used, in lighting a fairly large machine shop? The shop in question is 50 by 200 ft. in size, and has a saw-tooth roof with windows all along both sides and the ends. Drill presses, planers, shapers, saws, milling machines and other tools all have individual motors so that there are no belts to interfere with overhead installation. Should a system of general illuminating be installed, or would a mixed system of general and local lighting be better or cheaper? What special provision should be made for the work benches along the sides of the shop? If general illumination is best, what intensity should be used, and what size lamps would give the best results?—N. S. T., Detroit.

No. 515.—Precautions Taken in Grounding Lines and Buses.—What precautions are taken to guard against errors in making ground connections in power houses to high-tension cables and buses? Mistakes that have been costly in both life and property have been made, and it is believed that a free discussion of present common practice will be of much benefit. What bus- and line-clip arrangements are used? What locks and hold cards are used? Is it common practice to check connections twice or to have two different men check the connections? Are definite steps taken to see that the ground is maintained even though a mistake has been made?—A. L. T., New York City.

No. 516.—Winding for Three-Phase Motor.—I have a four-pole, 220-volt, three-phase induction motor rated at 0.5 hp. and rewound with 24 coils in 24 slots. The coils are arranged and connected as a lap winding. The motor which was made by the General Electric Co., Schenectady, N. Y., has a squirrel-cage rotor. The coils are connected in one Y circuit, there being two coils per group with 109 turns of No. 20 double-cotton-covered wire per group. The winding pitch is from 1 to 6.

Will someone draw a diagram illustrating the direction of current flow in the windings described above? Considerable trouble is being experienced with heating. It is believed that some of the coils are bucking each other. The full-pitch winding of this motor would be from 1 to 7.—R. J. B., Racine, Wis.

No. 517.—Refinishing Brass Tubing.—Can someone give a good and practical method of refinishing brass tubing and fixture parts? The tubing which I have under consideration at the present time is corrugated.—A. S. N., Plymouth, Mass.

No. 518.—Use of Current Transformers.—Will someone please explain why current transformers are used in connection with a-c. ammeters instead of shunts? I presume that it is due to an ununiform reactance in the instruments with different current values. Am I correct, and are there any other reasons such as skin effect in the shunt or safety? Are shunts ever used, or were they ever used with a-c. ammeters?—J. B., New York City.

No. 519.—Protecting Transformer Poles Near School Buildings.—In the safety-first meetings of the company where I am employed the matter of protecting transformer banks near school buildings has been brought up. The proposition is to determine what protection is required to prevent accidents that might result from children climbing the poles. What precautions are taken by other companies to guard against such accidents?—C. W. B., Enid, Okla.

Answers.

No. 509.—Connecting Single Transformer in a Three-Phase Bank.—I have three single-phase, 5-kv-a. Westinghouse transformers, rated at 2200 to 220 and 110 volts, and want to know if I can use them connected together on a three-phase cirrcuit and get 220 and 110 volts on the secondary side. If so, will someone please explain how to connect them and make a simple diagram for a guide?—R. L. G., Reynolda, N. C.

Answer.—The accompanying diagram shows how a bank of three single-phase transformers

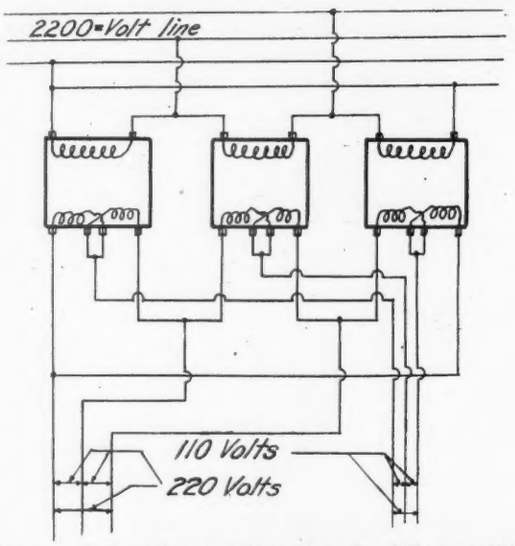


Diagram of Transformer Connections for 220- and 110-Volt, Three-Phase Circuit.

may be connected to make a 220-110-volt, three-phase circuit.—C. B., Bisbee, Ariz.

No. 512.—Proper Size of Wire for Long Motor Circuit.—What is the correct size of wire to use in running a 440-volt, three-phase circuit to a 50-hp. induction motor located approximately 6100 ft. from the power house? The motor will run a centrifugal pump requiring an input of about 35 or 40 hp. for three or four hours each day. Would it be cheaper, or save any power, if transformers were used to increase the voltage to 2300? Can I use a synchronous motor on 440 volts and get as good results as using the induction motor with transformers to raise the line voltage?—R. L. T., Rochester, N. Y.

Answer.—If power is generated at 2300 volts a No. 6 hard-drawn copper wire and a bank of transformers could be used at the pump house to reduce the voltage to 440. This would be the logical plan if energy is generated at 2300 volts. But if energy is generated at 440 volts a No. 2 wire can be used with a line drop of 29 volts. This would operate the motor satisfactorily, as a motor will operate properly either on a 10%

over or under voltage. This is assuming a power-factor of 85%.

Polyphase synchronous motors start with about 25% of full torque, but require a very large starting current. Because of their low starting torque and excessive starting current, synchronous motors are used only in the larger sizes and where frequent starting with a load is unnecessary.—V. H., Springfield, Ill.

Answer.—Running a low-voltage line for power or lights a distance of 6100 ft. should not be thought of unless absolutely necessary. The first cost of a suitable equipment for transforming the low voltage to 2300 volts and then back to 440 volts would exceed the cost of the necessary cable and extra line equipment for the 440-volt line, but the continued economy and efficiency would soon make up for the added first cost.

The transformers to be used should be six 15-kv-a., single-phase, 2300-volt units. These transformers should be placed three at each end of the line, and should be connected in delta on both the primary and secondary sides. The secondary connections to the transformers should not be less than No. 0 copper wire and No. 10 copper wire is sufficient for the 2300-volt line.

The induction motor with a squirrel-cage rotor will give better results than the synchronous motor, especially when used with a centrifugal pump, whether belt-driven or direct-connected.—P. T. W., Paulding, O.

Answer.—It would be advantageous to use transformers to step up the line voltage to 2300 volts for use with an induction motor. Line losses are approximately the same for both voltages, but a great copper saving is accomplished by 2300-volt transmission.

A synchronous motor operating at 440 volts has its advantages offset by the need of direct current for excitation, difficulty in starting, excessive cost of line copper, and the fact that it is not needed in this case.

The following calculations are based on the assumption that the transmission voltage will be 2300:

$$R = 0.01 \times S \times (E \times PF)^2 / Kw \times L$$

where R is the resistance of wire used in ohms per 1000 ft., S is the allowable loss in percent, E is the voltage between wires, PF is the power-factor, Kw is the power used in kilowatts and L is the length of line in feet.

$$R = 0.01 \times 10 \times (2300 \times 0.8)^2 / 50 \times 6100 = 1.11$$

The wire suiting this condition is No. 10 B. & S. gauge copper which has a resistance of 0.998 ohms per 1000 ft. This will carry the full-load current of 16 amperes per phase required for a 50-hp. motor.—S. S., New York City.

BOOK REVIEWS

"Straight Business in South America." By James H. Collins. New York: D. Appleton & Co. Cloth, 285 pp. (8 ins. by 5 ins.). Supplied by Electrical Review Publishing Co., Inc., for $2.50.

In this volume the author has made an effort to present the various aspects of business in South America. The material serving as the basis of the work was gathered in a rather extended trip through Argentina, Brazil, Chile, Uruguay and Peru. The text treats of the people and the country, banks, ships, distribution, retailing, advertising, etc. Separate chapters are devoted to opportunities and needs in South America. The author's experience in handling problems such as that undertaken has fitted him particularly well for the preparation of such a book.

"Modern Welding Methods." By Victor W. Page. New York: Norman W. Henley Publishing Co. Cloth, 278 pp. (8.25 ins. by 5.25 ins.) with many illustrations. Supplied by Electrical Review Publishing Co., Inc., for $3.

The general subject of welding is covered in nine chapters dealing with methods of joining metals, properties of common metals, welding gases, oxyacetylene welding, electric resistance and arc welding, thermit welding, soldering and brazing, and forge welding and heat treatment of steel. Data included in tabular form gives much useful information relative to tempering of metals for various purposes. Many typical and specific illustrations are employed to show the methods and ideas presented in the text.

This volume should be particularly interesting to persons engaged in the working of metals or the development of welding processes.

"Elementary Electrical Engineering." By Ralph Preston Clarkson. New York: D. Van Nostrand Co. Cloth, 182 pp. (7.25 ins. by 5.25 ins.) with numerous illustrations. Supplied by Electrical Review Publishing Co., Inc., for $2.

The subject matter of this book is divided into six chapters, the first being of a general nature. The succeeding chapters take up units and terms, solution of circuits, generation of electricity, measuring instruments and illumination and power. Both alternating and direct-current equipment and theory are treated in an elementary manner. No attempt has been made to go into the complicated mathematics of electrical engineering or treat the various types of equipment in minute detail. For so brief a work a large variety of material is covered in an easily read fashion.

"A Text Book of Electrical Engineering." (Fifth edition.) By Dr. Adolph Thomalen. Translated by George W. O. Howe. London: Edward Arnold. Cloth, 474 pp. (9 ins. by 5.5 ins.) with many illustrations and curves. Supplied by Electrical Review Publishing Co., Inc., for $9.

In the preparation of this new edition a number of minor alterations have been made and several subjects have been introduced which were not dealt with in former editions. The differential booster and automatic voltage regulators are treated in this edition, while several machines of obsolete type have been omitted. The symbols adopted have been modified to conform with the recommendations of the International Electrotechnical Commission.

The book is divided into 20 chapters, starting with fundamentals and working up to the more complicated problems. The last two chapters deal with single-phase motors and rotary converters.

NEW APPLIANCES

Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market

Illuminated Window Sign.

The "Kolite" window-display sign, shown in the accompanying illustration, is manufactured by Kallath Bros., Schenecady, N. Y. It is intended for use in the windows of doctors, dentists, and

Display Sign for Window Use.

other professional men. The device is small and presents a finished appearance either in the daytime or when lighted in the evening. The fixture is supported on a bracket attached to a wooden block intended to be screwed to the window casing or other suitable support.

These signs have opal-glass fronts with raised colored letters and are illuminated with two 15-watt candelabra lamps.

"Keldon" Commercial Lighting Unit.

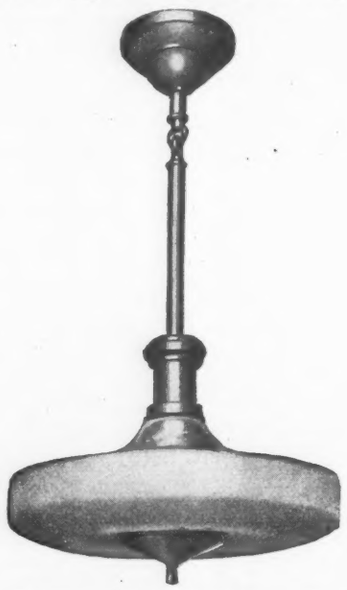
The "Keldon" is a totally inclosed semi-indirect commercial lighting unit, manufactured by the Ivanhoe-Regent works of General Electric Co., Cleveland. It is recommended for stores, offices, schools, hospitals and other places where diffused light of high intensity is needed at desks and tables for close work, or at counters and cases for the examination of goods displayed for sale. The glass globe of the "Keldon" is blown in one piece and enameled on the sides and bottom. Light diffusion equal to that of the best heavy-density glass bowls is said to be obtained. The con-

Ceiling Type of Fixture.

tour of the globe, density of the enamel and the position of the lamp all help reduce the brightness of the unit, and thus make possible light of high intensity without uncomfortable glare from its source.

The "Keldon" affords two advantages in its use. Being totally inclosed it does not suffer reduced efficiency through the accumulation of dust and dirt on the lamp or inside the globe. Dust that may collect on the exterior can be quickly removed from the smooth glass surface with a moist cloth. It is unique in the inclosed-glass-unit line in that the lamp can be removed or replaced without disturbing the globe itself. The lamp and socket are made quickly accessible by the removal of the bottom cap.

The entire unit is packed at the factory in a standard carton. In assembling the unit the suspension stem should first be connected and wired to the ceiling outlet. The brass holder tube may then be passed through the neck of the globe by inserting it through the lower open-



Fixture With Suspension Stem.

ing. To hang the globe holder the tube is pushed into the cap until the top spring is compressed and then turned to the right to permit the bayonet slots to engage the three supporting lugs. The lamp can then be placed in the socket through the bottom opening and the latter covered with the brass cap. Dirt is the greatest factor in the depreciation of lighting equipment and is especially serious where open bowls are used for indirect lighting. As has been pointed out above depreciation due to dirt has been greatly reduced by the construction of the "Keldon."

Duquesne "Six-in-One" Unit.

The lighting fixture made by the Duquesne Electric & Manufacturing Co., Pittsburgh, Pa., and known as the "Six-in-One," is particularly suitable for installation in stores, schools, hotels, offices, restaurants, factories and public buildings. Being made of heavy spun copper, this fixture should have a long life. The name of the unit has been chosen because of the fact that six separate and distinct designs can be made with each unit. An interchangeable fitter adapts the unit to receive either a 3.25-in. or a 6-in. glass or metal reflector.

One Style of "Six-in-One" Unit Assembly.

Since this unit is made of copper, and all parts join and fit properly to give the maximum of protection, it may be used outdoors as well as inside.

Surface-Type Toggle Snap Switch.

The toggle surface switch being placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn., differs from the ordinary snap surface switch in that manipulation is by the throw of a lever or toggle instead of by the turning of a key or button. Throwing the lever up makes the circuit, and throwing it down breaks the circuit. The movement is positive and the make-and-break quick and definite.

Toggle Switch With Porcelain or Composition Base.

The advantages of the toggle movement in a surface switch are threefold: First, it permits making the switch attractive and strong; second, manipulation is convenient, and third, the switch is self-indicating, the position of the lever showing at a glance whether the current is "on" or "off" without any marker or dial.

Electrically, the Hubbell toggle surface switch conforms with the rigid requirements of current practice. Mechanically, it is amply strong to stand

severe use, special care having been given to selection of materials and proportioning of parts to assure dependability. It combines good mechanical and electrical features with a good appearance.

Electrically Operated Pump With Hand-Operating Feature.

An electrically operated pump with a hand-operating feature for emergency service has been developed by the Humphryes Manufacturing Co., Mansfield, O. The pump is mounted on a subbase for bolting to the floor, and has a drip trough for catching oil and waste water. The gears and pinions are machine-cut, and rawhide or micarta can be used if desired.

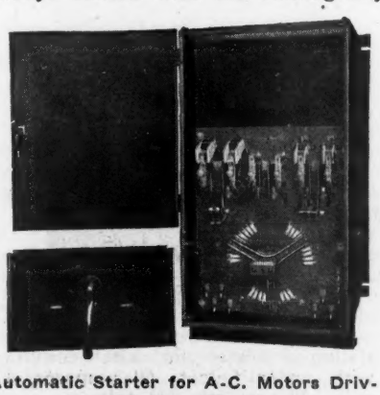
Either a 1-hp. or a 0.5-hp. motor can be used, the former being operated at a maximum discharge elevation of 175 ft., and the latter at 100 ft. Either a-c. or d-c. motors are supplied in accordance with local requirements.

An Inclosed Motor Starter With Speed-Setting Lever.

An addition to the line of "Pre-Set" printing-press control equipment made by the Cutler-Hammer Manufacturing Co., Milwaukee, Wis., is shown in the accompanying illustration. This automatic motor starter is used for the control of slip-ring motors driving cylinder presses, small webb presses, folders, paper-box machines, and other machines requiring a high starting torque and occasional changes in speed. The speed is determined by the setting of a three-arm rheostat.

The control panel together with the grid resistors is completely inclosed in a sheet-metal case to prevent accidental contact of the operator with any live parts. The starter can be set for the particular speed at which the machine is to be operated by means of the speed-setting lever, which is external to the case. A hinged cover permits exposing the switch equipment for inspection, and may be locked to prevent tampering with the starter. Wiring is facilitated by providing holes in the bottom of the case for the entrance of conduit.

This starter is operated from one or more push-button stations located at any desired points. Reversing may be accomplished by the use of a separate reversing switch. Starting, running, stopping and inching takes place through a magnetic primary contactor and two secondary contactors controlled from the push-button stations. The motor is always started with the starting-duty resistor in circuit by operating the "run" button. When the motor reaches the proper speed the button is released which causes the starting-duty resistor to be cut out of circuit and the speed-regulating resistor to be inserted, bringing the motor to the speed for which the resistor is set. The rotor currents are balanced on all steps, and a 50% speed reduction can be obtained at one-half the rated load of the motor.



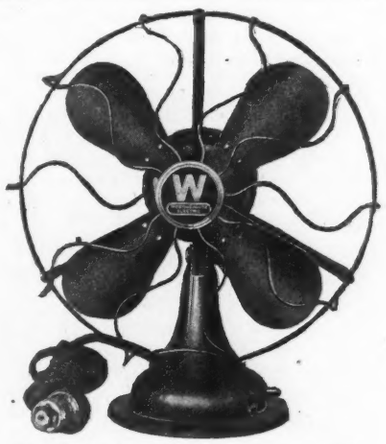
Automatic Starter for A-C. Motors Driving Printing Machinery.

Operation of the "stop" button opens the primary switch, bringing the motor to rest. The press or other driven machine can be inched by means of the "run" button after turning the "stop" button a quarter turn to the right.

Powerful magnetic blowouts are provided on the primary contactor and on the last secondary contactor. "Slow" and "Fast" legends on the inclosing case indicate which way to operate the speed-regulating lever to obtain slower or faster speed. The motor is automatically disconnected from the line upon failure of voltage until the "run" button is again operated, thereby providing protection to the motor and the operator of the driven machine.

Fans With Blades Finished in Dull Black.

A dull-black finish for the blades and guards as well as the motor and base

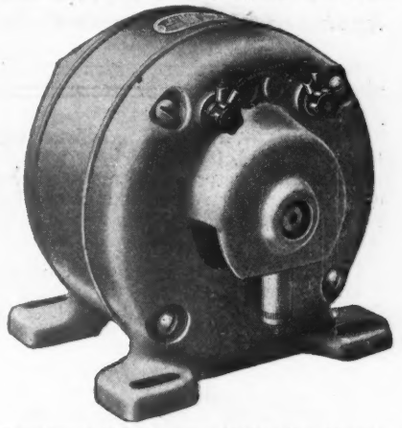


Electric Fan to be on Market in 1921.

is the feature of the line of fans which the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., will place upon the market. Previously blades and guards were made of highly polished brass, coated with a transparent lacquer. The change of the finish is said to add materially to the beauty and unobtrusiveness of the fans. The absence of a bright finish precludes reflections of light while the fan is oscillating. The six-blade fans will be discontinued this year.

"Twin R" Fractional-Horsepower Motors.

A line of fractional-horsepower A-C motors for household and industrial applications has been developed and put on the market by the American Radio & Research Corp., New York City. Motors of 0.16, 0.25 and 0.33-hp. sizes are being made. The motors are built to operate continuously at full rated load on rated voltage and frequency with a temperature rise not exceeding 40 deg. C., and they will carry an overload of 25% for 1 hr. without injurious heating, according to the statement of the manufacturer. They will operate successfully on circuits varying not more than 10% above or below rated voltage and 5% above or below rated frequency. They are regularly wound for operation on 110-volt circuits, but are also made for 220-volt circuits. The starting torque is about 1.33 times full-load torque, and the pull-out torque is approximately twice full-load torque.



Fractional-Horsepower Motor for Household or Industrial Use.

The frame which is made of high-grade grey iron is of the cap and cap design. The bearing opening in each cap is hooded, thus making a splash-proof motor. The steel band connecting the caps is so spaced from the stator as to allow the free circulation of air, keeping the operating temperature low and increasing the overload capacity. The rotor is the squirrel-cage type, and is built of electrical steel, japanned on both sides.

Berwick Electric Rivet Heater.

An electric heater for rivets has been placed on the market by the American Car & Foundary Co., New York City. In operating the machine the rivets are placed between the jaws of an electrode in the secondary circuit of a low-voltage transformer. Depressing a pedal opens the jaws for inserting or withdrawing the rivets which can be handled with ordinary tongs. A current consumption of approximately 20 kw-hrs. is required for heating 100 lbs. of any sized rivets, according to the statement made.

The design is such that there is said to be no danger of the pedals becoming charged, nor of a short-circuit, unless the machine is overloaded for long periods by heating rivets of larger diameter than the wiring permits. As a rivet is heated sufficiently in from 20 to 30 sec. after being inserted in the machine the rivet gang is not liable to be kept waiting, nor is it necessary to start the heater before the riveters go to work. A supply of heated rivets of from one to ten per minute can be depended upon at all times, and as soon as a job is finished the current can be turned off.

Machines of this kind are portable and can be placed close to the work. An advantage claimed for this type of heater is that the rivets are in plain sight where they can be inspected readily, reducing to a minimum the losses from overheating and burning.

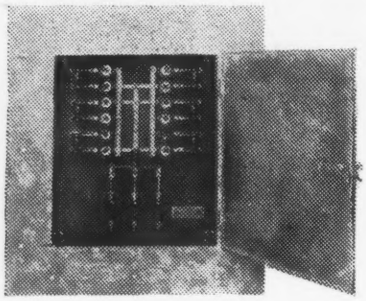
LATEST APPROVED APPLIANCES

Approved by Underwriters' Laboratories, Following Examination and Tests Conducted Under the Standards of the National Electrical Code

Bushings.—Adapti Co., Cleveland. Listed Oct. 15, 1920.

"Adapti" composition material for use with standard locknuts; catalog Nos. 01200-09.

Cabinets and Cutout Boxes, Sheet-Metal.—Electric Motor & Engineering Co., 2nd street S. W. and B. & O.



View of "E. M. & E. Co." Cabinet.

R. R., Canton, O. Listed Oct. 19, 1920.

Standard for fire and label service.

Cabinets and Cutout Boxes, Sheet-Metal.—Independent Metal Box Corp., 650 Metropolitan avenue, Brooklyn, N. Y. Listed Nov. 16, 1920.

Standard for fire and label service.

Conduit Boxes.—United Electrical Manufacturing Co., Adrian, Mich. Listed Nov. 2, 1920.

"Trojan" pressed steel conduit boxes; catalog No. 24151.

Cutout Bases, Plug-Fuse.—Fernando C. Mesa, Irvington, N. J. Listed Dec. 3, 1920.

"F. C. M." plug-fuse cutout bases; 0-30 amperes, 125 volts; catalog Nos. 2199 and 2587.

Conduit Boxes, Fittings.—H. T. Paiste Co., 32nd and Arch streets, Philadelphia. Listed Nov. 5, 1920.

Stamped steel covers for mounting receptacles, snap switches and ro-

No. 316, for Outlet-Box Rosette.

No. 1173, Outlet-Box Adapter.

settes; catalog Nos. 306-16; porcelain covers for use as rosettes; catalog Nos. 1172-73.

Fittings, Fixture.—Butler Electric Co., 3531 Cottage Grove avenue, Chicago. Listed Nov. 30, 1920.

Insulating support for chain fixtures; "Beco." catalog Nos. 2, 2B, 2S, 8A and 8E; "Cisco." catalog Nos. 50, 52, 52B, 56, 58A and 58E.

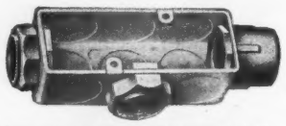
Ground Clamps.—S. R. Fralick & Co., 15 South Clinton street, Chicago. Listed Nov. 2, 1920.

"Chicago" ground clamps for use with ⅜-in. to 3-in. rigid conduit; catalog Nos. 101, 102 and 103.

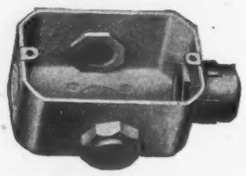
Ground Lamps.—Conduit Fittings Co., 411 South Clinton street, Chicago. Listed Oct. 29, 1920.

"O." ground clamps for use at outlets in combination gas and electric work for securing gas pipe to outlet box.

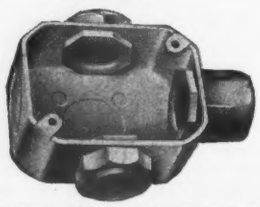
Conduit Boxes.—Sprague Electric Works of General Electric Co., 527 West 34th street, New York City. Listed Nov. 30, 1920.



Branch Type "Spraguelet."



Deep Type "Spraguelet."



Shallow Type "Spraguelet."

Pressed-steel conduit fittings; "Spraguelets" for use as outlet and junction boxes and for mounting sockets, receptacles and switches; shallow type, catalog No. 14241; deep type, catalog No. 34461; branch type, catalog No. 48241; with "Spraguelet" ½-in. and ¾-in. couplings and with covers of steel or porcelain.

Outlet Bushings, Service Entrance.—Butte Electric & Manufacturing Co., 534 Folsom street, San Francisco. Listed Nov. 5, 1920.

"Sealet"; outlet bushings consisting of two threaded metal parts, a pair of insulating discs and a rubber gasket, designed to prevent entrance of moisture; ½ to 4-in. pipe size.

Outlet Plates.—Collinson-Holland Co., 253 Medford street, Malden, Mass. Listed Nov. 12, 1920.

"Algor" castiron outlet plates with clamps for armored cable.

Outlet Bushings.—M. B. Austin & Co., 700 Jackson boulevard, Chicago. Listed Oct. 22, 1920.

Austin Type A Bushing.

Die-cast conduit outlet bushings, Type A.

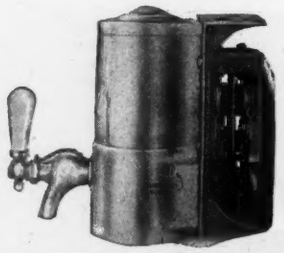
Farm Lighting Plant.—Electric Auto-Lite Corp., Willys Light Division, Toledo, O. Listed Nov. 30, 1920.

Non-automatic starting, internal-combustion engine (standard portable) for use with gasoline and electric generator, control apparatus and storage battery, for small isolated, stationary installations. Electrical control automatically stops engine when batteries are fully charged. "Willys Light" model GM; rating: generator ¾ kw., 32 volts; gasoline capacity, 2 gals.

Heaters, Hair Dryers.—Herman J. Bosch, Hotel Biltmore, New York City. Listed Nov. 30, 1920.

Consisting of heating element inclosed in case having provision for attachment to compressed-air supply and openings for emission of heated air, and switch designed to control air and current simultaneously; 3-5 amperes, 125 volts.

Heating Appliances, Liquid.—Aqua Electric Heater Co., 250 West 54th street, New York City. Listed Nov. 30, 1920.



"Aqua" Instantaneous Water Heater.

"Aqua" electric water heater consisting of heater and switch combined with water faucet; 60 amperes, 110 volts, 30 amperes, 220 volts.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Sparling Electric Co., Buffalo, N. Y., has filed notice of dissolution under state laws.

Bozart Lighting Co., New York City, has filed notice of increase in capital stock from $30,000 to $75,000 for proposed expansion.

Connecticut Electric Equipment Co., Meriden, Conn., has filed notice of increase in capital stock from $25,000 to $100,000 for expansion.

Wurgler Starter & Battery Co., 154 Jefferson street, Perth Amboy, N. J., manufacturer of electrical equipment, has filed notice of dissolution under state laws.

Pennsylvania Light Co., 76 Fullerton street, Pittsburgh, has been taken over by Clyde Garber and Joseph M. Greenberg, and will be continued in operation by the new owners.

Edward Valve & Manufacturing Co., East Chicago, Ind., manufacturer of washing machines, etc., sustained a loss by fire Jan. 5, the damage being estimated at $300,000.

Allen-Bradley Co., 284 Greenfield avenue, Milwaukee, manufacturer of electric controlling devices, has increased its capital stock from $186,000 to $250,000 for expansion of its business.

Crouse-Hinds Co., Syracuse, N. Y., has issued bulletin No. 304-A containing listings of "Imperial" projectors and reflectors developed since the publication of bulletin No. 304, which is still effective.

Pawling & Harnischfeger Co., Milwaukee, manufacturer of electric traveling cranes, etc., has increased its capital stock from $1,000,000 to $3,000,000 to take care of its extensive plant development program.

United States Electrical Manufacturing Co., 300 South Central avenue, Los Angeles, Cal., manufacturer of motors, plans to enlarge its business by the erection of an additional plant. The company was recently reorganized, those interested being H. G. Steele and C. E. Johnston.

Goulds Manufacturing Co., Seneca Falls, N. Y., manufacturer of pumps, has announced the appointment of Edward S. Jenison as acting general sales manager to succeed W. E. Dickey, who resigned Jan. 1. For the past five years Mr. Jenison has been manager of the company's Philadelphia office.

Cutler-Hammer Manufacturing Co., Milwaukee, has distributed publications 875 and 876. The former booklet describes the Thomas meter which is used for measuring large quantities of commercial gases and air. Publication 876 covers the Thomas calorimeter, which gives graphical records of the total heating values of gases. The temperatures are measured by two electrical thermometer units using the principle employed in the Thomas meter.

Allis-Chalmers Manufacturing Co., Milwaukee, has issued bulletin No. 1087-C covering its polyphase induction motors, which are built in both the squirrel-cage and the wound-rotor types.

Edison Lamp Works of General Electric Co. is now operating in a large building on Codwise street, New Brunswick, N. J., forming a portion of the former plant of the Wright-Martin Aircraft Corp. About 200 employes form the present working force.

Republic Carbon Co., Inc., Niagara Falls, N. Y., manufacturer of "Republic" electrodes, has issued a booklet giving a review of the development of the electric furnace, the economic operation and advantages of such equipment, and a description of the manufacture of carbon electrodes.

Bussman Manufacturing Co., St. Louis, manufacturer of "Buss" fuses, has published a house-organ under the title of "The Buss Short-Circuit", the first number of which appeared this month. It is "devoted to spreading the gospel of electricity's safety valve among 'Buss' distributors, jobbers and their salesmen." The January issue consists of 16 pages and contains some interesting data on the manufacture of fuses. The booklet is illustrated with cartoons which aim to bring out various "talking" points in the sale of the Bussman product.

National X-Ray Reflector Co., Chicago, has announced that it has sold an installation of X-Ray indirect lighting fixtures for the new Field Museum of Natural History now being completed in Chicago. This building is a gift to the city of Chicago by the Field Estate and takes the place of the 1893 World's Fair building in Jackson Park that formerly housed the extensive art collection. The lighting installation comprises 396 indirect fixtures. The low wattage of 0.8 watt per sq. ft. will provide excellent illumination, as the walls and ceilings are white, with little decoration.

Arrow Electric Co., Hartford, Conn., manufacturer of the "Arrow" line of electric wiring devices, has published a booklet entitled "A Trip Through the Plant of the Arrow Electric Co.," which illustrates and describes the offices and various departments of the company and the production activities in the plant.

Duplex Lighting Works of General Electric Co. held its annual sales convention Dec. 28-30 at the Vanderbilt Hotel, New York City. The salesmen from San Francisco, Seattle, Dallas and the various other headquarters throughout the country were called to New York City for a resume of the 1920 operations and to go over plans for larger activities this year. The program covered talks by the men on merchandising, sales policy, methods, advertising, etc. After each talk there was a general discussion of the subject, in which W. L. Goodwin took a prominent part. As a fitting climax to the convention a banquet was given on Thursday evening, Dec. 30, when before about 150 representatives addresses were made by W. L. Goodwin, W. G. McKitterick, Clarence L. Law, J. B. Becker and H. B. Kirkland. In addition to the sales force the following were present: S. E. Doane, manager of the engineering department, National Lamp Works of General Electric Co.; E. W. Rockafellow, general sales manager of the Western Electric Co.; H. Q. Forman, Sibley-Pitman Electric Corp.; Leslie Latham, E. B. Latham & Co.; J. B. Becker, United Electric Light & Power Co.; Clarence L. Law, New York Edison Co.; W. L. Goodwin, General Electric Co.; W. G. McKitterick, sales manager of the National Lamp Works of General Electric Co., and H. B. Kirkland, American Wiremold Co. The convention was the most successful the company has ever held and the men, after having had a share in preparing the policy, plans and advertising for 1921, went back to their territories filled with enthusiasm.

Sales Convention of Duplex Lighting Works of General Electric Co., Held in New York City Dec. 28-30.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

W. P. HOLCOMBE has been appointed purchasing agent of the Brooklyn (N. Y.) Edison Co.

JOHN J. LAMB has been appointed safety engineer of the National Safety Council, Chicago, to succeed R. H. Guerrant who has resigned.

ROBERT ISHAM RANDOLPH, consulting engineer, Chicago, has been elected president of the Chicago Chapter, American Association of Engineers.

CHARLES A. VOLZ has been appointed chief of the division of heat, light and power, New York State Public Service Commission, second district, Albany, N. Y.

STANLEY A. RUSSELL, head of the public utility department of the National City Co., New York City, has been elected an assistant vice-president of the company.

F. D. GORDON has been appointed general manager of the Cumberland County Power & Light Co., Portland, Me., to succeed A. H. Ford, who resigned some time ago.

BERNE H. EVANS, Harrisburg, Pa., has resigned as chief counsel for the Public Service Commission to become associated with the law firm of Hause & Baker, Harrisburg.

GEORGE H. WHITEFIELD, electrical engineer, Montclair, N. J., has been appointed supervisor of repairs and supplies of the State Department of Institutions and Agencies, effective Jan. 3.

E. C. LEWIS, who was formerly employed in the Lynn and Schenectady plants of the General Electric Co., has been appointed assistant mechanical engineer of the Hygrade Lamp Co., Salem, Mass.

W. J. THARP has been appointed secretary-treasurer of the Arkansas Utilities Association to succeed S. E. Dillon, who has resigned. Mr. Tharp is secretary and auditor of the Little Rock (Ark.) Railway & Electric Co.

EUGENE H. PADDOCK has been appointed resident engineer of the Tayford Co., Inc., Lee, Mass., in charge of hydroelectric development work. He was formerly assistant sanitary engineer in the United States Public Service.

H. C. DEFFENBAUGH, who, since February, 1920, has been division engineer of the New York water power investigation being conducted by Col. William Barclay Parsons, consulting engineer, 84 Pine street, New York City, has resumed his former position of engineer and assistant to the secretary of the Empire State Gas and Electric Association, Grand Central Terminal, New York City.

T. E. FLANEGIN, formerly manager of the Detroit office of Blair & Co., has been placed in charge of a new branch office which H. M. Byllesby & Co., Chicago, has established in suite 1614 Dime Bank building, Detroit. He has had considerable experience in the investment securities business and will look after that end of the Byllesby activities throughout the state of Michigan.

CHARLES L. EDGAR, president of the Edison Electric Illuminating Co. of Boston, celebrated his sixtieth birthday recently, the occasion being marked by the presentation from the company's employes of a gold wrist watch, a set of cuff links and an illuminated parchment setting forth the esteem in which Mr. Edgar is held by the men and women employed by the Boston utility.

C. H. SHEPHERD, formerly electrical engineer for the Commissioners of Lincoln Park, Chicago, has resigned

C. H. Shepherd.

from that position to become associated with the Bemis Co., engineer-accountant, 139 North Clark street, Chicago. After graduating from the University of Wisconsin in electrical engineering he went with the Allis-Chalmers Manufacturing Co., Milwaukee, as a student engineer at Norwood, O., later becoming connected with the Commonwealth Edison Co. as chief operator of the Fisk street station, Chicago. He resigned that position to assume the duties of chief operator of the electrical department, Commissioners of Lincoln Park, and was later made operating engineer for this department, having charge at that time of all design and layout work for the reconstruction of the power and lighting system. Mr. Shepherd was afterwards connected with the department of gas and electricity of the city of Chicago, and when the bureau of engineering and construction was formed he was made chief layout engineer and placed in charge of the design, layout, estimating and ultimate supervision of construction of all equipment connected with the municipal street-lighting system of Chicago. He resigned in 1914 to take the position of electrical engineer in charge of the electrical department for the Commissioners of Lincoln Park and immediately began to rebuild the Lincoln Park power and lighting system, which work was outlined in the Sept. 11, 1920, issue of ELECTRICAL REVIEW. After the construction work on this system had been reduced to a minimum, Mr. Shepherd became connected with the Bemis Co. and started and finished the physical valuation of the St. Paul City Railway Co.'s property, as well as several other jobs. During the last eight years Mr. Shepherd has done considerable consulting work relative to power and lighting systems and expects to continue in this capacity with the Bemis Co., which is taking over industrial valuation and appraisal work, as well as general engineering and public utility cases.

ALFRED SWAN, Upper Montclair, N. J., was a guest of honor on the occasion of his eighty-fifth birthday, Dec. 30, at a banquet given by his friends and associates of the Edison Lamp Works of General Electric Co., Harrison, N. J. Mr. Swan is well known as an inventor and his work has gone far in the development of the incandescent electric lamp, including the perfection of a standard base as now adopted. J. W. Howell, chief engineer of the plant, paid high tribute to Mr. Swan's achievements.

FRANK LYNCH, who has been in the service of the Commonwealth Edison Co. and its predecessors for 33 years, has retired as chief engineer of the Northwest station, which position he has occupied since that particular station was placed in operation. He retired at his own request on account of ill health and plans a trip to California. On his return to Chicago he will serve the company in a consulting and advisory capacity. The retirement of Mr. Lynch has brought about the following changes in the operating department's organization: A. D. Bailey, who has been chief engineer of Stations 1 and 2 since the resignation of Mr. Oleson in September, 1917, is given general operating charge of all steam-power plants of the company with the title of superintendent of generating stations; William Wardell, who has been assistant to the chief engineer of Station 1, is now chief engineer of that station; William Weyker, who has been assistant to the chief engineer of Station 2, is now chief engineer of that station; Edward Gilroy, who has been assistant to the chief engineer of Station 4, is now chief engineer of that station.

OBITUARY.

WILLIAM E. FRANCIS died Dec. 20 in Schenectady, N. Y. He established the marine engineering department of the General Electric Co. and was marine engineer of the company.

JOHN A. SIBELL, an electrician for 26 years in the employ of the New York Telephone Co., died at his home, 860 Marcy avenue, Brooklyn, N. Y., Jan. 1, of heart disease, aged 50 years.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Bangor, Me.—The Central Maine Power Co. has been granted permission by the Public Utilities Commission to take over and consolidate with its organization eight electric utility companies, with combined capitalization of over $2,000,000. The companies to be merged are the Hartland Electric Light & Power Co., Newport Light & Power Co., Union Light & Power Co., Waldoboro Water, Electric Light & Power Co., Solon Electric Light Co., Wiscasset Electric Light & Power Co., Brunswick & Bath Light & Power Co., and the Penobscot Bay Electric Co., with exception of the gas plant of the last noted organization at Belfast.

Biddeford, Me.—The Biddeford & Saco Water Co. is planning for the installation of new electric-operated pumping machinery at its waterworks station on Hollis Road. The present steam power operation will be replaced with electric service. The work is estimated to cost about $30,000.

Newcastle, Me.—The new grain elevator of the Muscongus Lumber & Grain Co., now nearing completion, will be electrically operated. Motors and other electrical machinery will be installed, with automatic unloaders, endless chain buckets, etc.

Sanford, Me.—In connection with a new power plant at its mills, the Goodall Worsted Co. has completed what is said to be the tallest smoke stack in New England. The stack is of radial brick, 23 ft. 10½ in. at the base, and 12 ft. in diameter at the top; it is 302½ ft. high. It was constructed in 15 sections and three tapers, and cost about $30,000. It was built by the Alphons Custodis Chimney Construction Co., 95 Nassau street, New York.

Boston, Mass.—Stockholders of the Boston Suburban Electric Co. are arranging a plan of reorganization, to include necessary extensions and betterments in plants and system.

Springfield, Mass.—The Springfield Street Railway Co., North Main street, is planning for the construction of a new machine shop at Palmer, to replace the structure recently destroyed by fire.

Worcester, Mass.—The Department of Public Utilities has granted the New England Power Co., permission to dispose of a bond issue of face value of $550,000, at a price of not less than $82.00 on each $100.00 of par value. The proceeds will be used for general operation and expansion, being part of a total authorized issue of $14,000,000.

Bridgeport, Conn.—The plans for the power plant that the United Illuminating Co. is contemplating erecting on the east side of Bridgeport's main harbor at the foot of East Main street, are now before the city building department. The cost is estimated at $210,000. Westcott & Mapes, engineers, have prepared plans.

New Haven, Conn.—Electrical equipment and machinery will be installed in the new plant to be erected by the Connecticut Sash & Door Co., 451-59 Grand avenue, to replace its factory recently destroyed by fire. The new plant will be four-story and is estimated to cost about $75,000.

Buffalo, N. Y.—A power agreement is being arranged between the City Commission and the Niagara Power & Development Co., subject to approval by the City Council, to provide for the establishment of a new hydroelectric power plant at Niagara Falls with high-power transmission line to Buffalo, to furnish service for the city. The company has agreed to furnish service at a flat rate of $15 per hp. The proposed generating station is estimated to cost in excess of $5,000,000. City Commissioner Ross Graves is handling the details for the city.

Depew, N. Y.—The Depew & Lancaster Light, Power & Conduit Co. has been granted permission by the Public Service Commission to construct and operate a new electric power plant in Boston township, Erie county. A franchise has recently been granted the company at this place.

New York, N. Y.—The Consolidated Gas Co. has made application to the Public Service Commission for permission to acquire 75% of the total capital stock of the Bronx Gas & Electric Co. The last noted company operates a plant at Unionport, and furnishes electric energy and gas to the Bronx section east of the Bronx river. The Bronx company was recently authorized by the Commission to issue bonds for $274,000 for general expansion and business operation. George B. Cortelyou is president of the Consolidated Gas Co.

Niagara Falls, N. Y.—A large block of common stock of the Niagara, Lockport & Ontarion Power Co., has been disposed of to a group of bankers at Buffalo and New York, carrying a controlling interest. The securities were purchased from the Albright interests, which have controlled the company for many years. It is said that a portion of the proceeds of the sale will be utilized for general expansion.

Avon, N. J.—The city council is considering the installation of a new electrically operated pumping plant to cost about $60,000. J. Thompson, commissioner, is in charge.

Bloomfield, N. J.—The Clark Thread Co., Clark and Ogden streets, Newark, N. J., will build a one-story power plant, 75 by 80 ft., to cost about $63,000, at its proposed new bleaching works in the upper Broad street section, estimated to cost about $133,000, including machinery. Plans for the structures have been completed. Adam H. Groel is general manager.

Bloomfield, N. J.—Schering & Glatz, 150 Maiden Lane, New York, will build a one-story power house at their new drug factory on Orange street, estimated to cost about $100,000, complete. Carl. F. Stiefel is president.

Lakehurst, N. J.—The Bureau of Yards & Docks, Washington, D. C., Navy Department, has completed plans for the construction of a new electrical distributing and street-lighting system here. C. W. Parks is chief.

Ridgefield, N. J.—The electrical installation at the new local plant of the Continental Folding Paper Box Co., 122 Washington avenue, Brooklyn, N. Y., at Grand avenue and Hall street, will be handled under the supervision of the Edward B. Scott Co., 175 Fifth avenue, New York, electrical engineer. The new factory will be two-story, 100 by 250 ft., and is estimated to cost about $400,000.

Fawn Grove, Pa.—The assets of the Fawn Light & Power Co., have been purchased by C. W. Webb and associates, York, Pa. The new owners will reorganize the company and propose to continue service. It is said that plant extensions and improvements will be made.

Harrisburg, Pa.—The Harrisburg Light & Power Co., 22 North Second street, is arranging an increase in its indebtedness from $10,500,000 to $10,800,000, the proceeds to be used for proposed extensions and improvements in electric plant and system. The company has construction under way on a new one-story power house on Cedar street. The company is planning the installation of new machinery and certain betterments to relieve the power shortage in its territory. H. W. Stone is secretary.

Johnstown, Pa.—Electric equipment, mechanical and refrigerating machinery will be installed in the new three-story and basement ice cream factory to be erected by the Gallagher Ice Cream Co. The structure will be 97 by 100 ft., and is estimated to cost about $150,000.

Philadelphia, Pa.—Electrical and mechanical equipment will be installed in the new car shop to be erected by the Department of City Transit, Chestnut street, at the Bridge street yards, to be used in connection with the Frankford Elevated Railway system. The proposed shop will cost about $147,000. For the operation of this railway system, plans are under way for the establishment of municipal electric plants, and preliminary plans, including measures for site acquisitions, are under way. These will be the first municipal operated sta-

tions, power for the city built subway and Market street elevated line being furnished by the Philadelphia Electric Co. and the Philadelphia Rapid Transit Co. William S. Twining is director of city transit.

Philadelphia, Pa.—John Wanamaker, Inc., Chestnut street, has taken title to the six-story factory and three one-story power houses at Broad and Carpenter streets, used in connection with its retail establishment.

Philadelphia, Pa.—The Public Service Commission has ordered the Philadelphia Suburban Gas & Electric Co., to submit an appraisal of its property in suburban communities in which an increased rate for service is being asked. The work of inventory is ordered to be completed by July 1, 1921. The work will include property in the Phoenixville, Jenkintown, Coatesville, Pottstown and West Chester districts.

Pittsburgh, Pa.—Considerable electrical and mechanical equipment will be installed in the proposed new plant of the Columbia Steel Shafting Co., Park building, to be located on property recently acquired at Ambridge, Pa. The initial works will comprise one and two-story buildings, totaling 600 by 600 ft., in area, and estimated to cost about $1,000,000 with machinery.

St. Clair, Pa.—The borough council has ordered the installation of electric meters for all consumers on the lines of the municipal electric light and power plant. Heretofore a residence rate of $1.50 a month has been operative and it is claimed that consumers have abused the privilege and utilized service for power and heating purposes. The borough is said to maintain the cheapest electric lighting service in the state.

Pittsburgh, Pa.—The United States Steel Corp. will install considerable electric-operated mining machinery at coal properties in the vicinity of Waynesburg, Pa., for the development and opening of new properties. A number of buildings will be constructed, including a power house. It is reported that the project will cost in excess of $3,000,000.

Pottsville, Pa.—The Public Service Commission has ordered the Pennsylvania Light, Heat & Power Co., to abolish its minimum charge plan, with permission to continue a service charge, as heretofore. This latter charge is 50 cents per month for every consumer, and is estimated to bring a revenue of $60,000 a year to the utility.

Waynesboro, Pa.—The chamber of commerce has appointed a committee to investigate the present high cost of electrical service, and to devise plans for a reduction in different parts of the city.

Baltimore, Md.—Electric equipment will be installed in the four-story administration building to be constructed at the St. Mary's Industrial School, 65 by 165 ft., estimated to cost about $500,000. Hugh I. Kavanagh, 913 North Calvert street, is architect.

Baltimore, Md.—The Department of Lamps & Lighting, John J. Hanson, superintendent, is planning the installation of a "white way" street-lighting system on Columbia avenue, Harford road, Hanover street, and a number of other main thoroughfares during the coming year. The work will be carried out as quickly as funds permit.

Baltimore, Md.—The United Electric Railways Co., Continental building, will make improvements and extensions in its building at Light and Heath streets, to cost about $10,000. The company is reported to be planning the construction of an electric substation in this section for increased power service.

Washington, D. C.—Congressman Stephens, Ohio, has introduced a bill providing for the purchase of a site in Porto Rico for the establishment of a new Government wireless station.

Washington, D. C.—The breakage of a turbine at the main power station of the Potomac Electric Power Co., Benning, D. C., caused an interruption of over one-hour in service on Dec. 30. This is the sixth time during the past year that accidents have caused similar difficulty. The company is planning the installation of new machinery in different substations in the city for increased service.

Cape Hatteras, N. C.—The Bureau of Yards and Docks, Washington, D. C., Navy Department, has awarded contracts to the Donnell-Zane Co., 350 Broad street, New York, for the construction of new radio compass plants at Cape Hatteras, Cape Lookout and at Poyners Hill. Contract for a similar plant at Virginia Beach, Va., has been awarded to H. M. Lucas, 115 Maple street, Portsmouth, Va.

Augusta, Ga.—The Southern Ohio Power Co. has been incorporated with a capital stock of $1,500,000 to operate an electric light and power system in Ohio. The incorporators are E. M. Leavitt, L. E. Haskell and Ernest L. McKean.

LaGrange, Ga.—Bonds in the sum of $20,000 have been voted, for the purpose of constructing electric light extensions. S. H. Dunson is mayor.

Leesburg, Fla.—The Grass Filber Pulp & Paper Co. has plans under way for the installation of an electric power plant. C. F. Logan is engineer.

Quincy, Fla.—The city has plans under way for the improvement of the electric lighting and power plant. The mayor is in charge.

Ocala, Fla.—The city council has approved plans for the installation of an ornamental street-lighting system on Main street.

St. Petersburg, Fla.—The Petersburg Electric Co. has plans under way to extend its lighting system, which will include 9th street, south along Ingleside avenue, and west to 16th street.

NORTH CENTRAL STATES.

Janesville, O.—The erection of a municipal electric lighting plant has been suggested to be erected at the city water works, at an estimated cost of $36,000. Henry Stehmeyer is in charge.

Middletown, O.—Plans are being prepared for extensive electrical improvements, including an ornamental street lighting system. Mr. Morrison is city engineer.

Powhatan, O.—The American Gas & Electric Co., 30 Church street, New York city, plans to erect an electric generating plant near this city.

Springfield, O.—The trustees of the Ohio Masonic Home have purchased a site for the building and erection of a power plant. Chas. F. Bucholtz is one of the trustees.

Centerville, Mich.—The village has entered into a contract with the Centerville Water & Electric Co. to furnish the lights and water for a term of 10 years, beginning Jan. 1, 1921.

Kalamazoo, Mich.—The Consumers Power Co. has plans under way for the construction of one or two power dams on the Manistee or Au Sable rivers, during the coming summer.

Owosco, Mich.—L. L. Conn, president of the chamber of commerce, recommends the extending of the ornamental street lighting in the residence district.

Sault Sainte Marie, Mich.—The city has plans for the extension of its lighting system on Portage avenue from the Park Hotel to the depot, and east on Portage to Kemp's dock. Thos. J. Watchorn, commissioner, is in charge.

Frankfort, Ind.—The city has plans under way to alter and erect an addition to the electric lighting plant. E. C. McMurphy, City building, is city clerk.

Wabash, Ind.—A company has been incorporated with a capital of $7,000,000 for the purpose of utilizing the water power of the Tippecanoe river. The plan is to build one of the largest hydroelectric plants, with five mammoth power stations along the lower end of the streams, at Winamac, Pulaski, Springboro, Monticello and Wabash.

Springfield, Ill.—The Quincy Electric Supply Co., through Fred L. Havermale, president, and Noel F. Havermale, secretary, will increase its capital stock from $6,000 to $50,000.

Ashland, Wis.—The L. E. Myers Co. will build a dam on the Flambeau river, and erect transmission lines for serving light and power to cities in the northern part of the state. The cost is estimated at $3,500,000. L. E. Myers, Monadnock building, Chicago, is president.

Colfax, Wis.—The Apple River Milling Co. has plans under way for the erection of a power house. E. J. Schneider of Amery is president.

Fennimore, Wis.—The Fennimore Prairie Electric & Power Co. has been incorporated with a capital stock of $25,000, the incorporators being Emil Schwer, R. M. Orchard, Anton Eisele and others.

Madison, Wis.—Mayor L. M. Kittleson will appoint a committee to investigate plans for the authorization of a municipal electric plant.

Manitowoc, Wis.—The Oslow Power & Light Co. will enlarge its plant, extend its wires, and make other improvements. Henry Groth is in charge.

Medford, Wis.—The Light & Heat Co. will extend its lines to the northern part of the town.

Sayner, Wis.—O. W. Sayner, postmaster at Sayner and owner of the

Plum Lake Resort there, will build an addition to the property which will enable him to care for more guests during the summer season. A complete lighting and water system will be installed. The improvements are estimated to cost about $6000.

Bush City, Minn.—Druar & Milinowski, engineers, 512 Globe building, St. Paul, have prepared plans for a power plant, dam and transmission line across the St. Croix river. The plans also include a 20,000-volt transmission line, the development of 20,000 kw. minimum capacity and a maximum of 60,000 kw.

Duluth, Minn.—The Duluth Edison Electric Co. will expend $165,000 for the building of a direct transmission line from the Great Northern Power Co.'s plant at Thomson, and the building of a transformer station at the southeast corner of 62nd avenue west and Grand avenue. C. E. Van Bergen is general manager.

Jasper, Minn.—The business men are planning to finance a transmission line from here to connect with the high power line from Pipestone to Trosky. Ihlen, 6 miles north of here will also be supplied from the new line.

Keewatin, Minn.—The city council is considering the question of the Great Northern Power Co. supplying heat, light and power to the city. H. J. Underhill is superintendent.

Esterville, Ia.—The Emmet County Power & Light Co. has filed a petition with the board of supervisors, for authority to construct a transmission line along the public highways. The J. J. Klopp Co. is auditor.

George, Ia.—H. C. Hatch has applied for the right to construct an electric transmission line in the county.

Iowa City, Ia.—The citizens are considering organizing a stock company, for the purpose of building an electric light and power plant. L. F. Rittenmeyer is one of the aldermen.

Nevada, Ia.—The Iowa Light & Power Co. has plans for the erection of an independent electric lighting plant in the city.

Fulton, Mo.—The Federal Light & Traction Co. of New York City, which owns the Springfield Gas, Electric & Traction companies, is planning to expand its holdings in the Ozark section of the state and now is negotiating with officials of Ash Grove and other small towns of that section with the idea of building a transmission line from Springfield to those cities and furnishing them with current for light and power purposes. The New York concern became interested in the project through the efforts of Bert E. Woolsey, mayor of Ash Grove.

Springfield, Mo.—The Springfield Gas & Electric Co. has plans under way for a number of extensions in its plant and system.

Topeka, Kan.—Bids will be asked for by Commissioner W. A. Stanfield for improvements and expenses necessary in the consolidation of the electric light and water plants.

Mitchell, S. D.—The city will install a new street lighting system in place of the present clusters. The city clerk is in charge.

SOUTH CENTRAL STATES.

Clay City, Ky.—The Clay City Motors Co. is planning to erect poles and transmission wire, to supply current to the town.

Irvine, Ky.—The Irvine Light & Power Co. is planning to expend $10,000 on improving its plant.

Chattanooga, Tenn.—A power plant, 42 by 50 ft., will be constructed by the Du Bois Rubber & Tube Co., 315 Volunteer State building, in connection with its proposed new automobile tire manufacturing plant on local site, 80 by 160 ft., estimated to cost close to $75,000. W. Lee McLane, address noted, is architect.

Millington, Tenn.—The town will vote on the question of a $20,000 bond issue for the purpose of erecting an electric light and power plant. The mayor is in charge.

Jackson, Miss.—The State Bond Improvement Commission is arranging a fund of $600,000 to be used for the construction of additions to the power plants at different state institutions, including repairs and betterments in existing stations. T. C. Link is architect.

Belcher, La.—The Burrough Council has plans under way, for the rebuilding of the burned electric light plant.

Lafayette, La.—The Columbia Telephone & Telegraph Co. will install a flash system, which is estimated to cost $23,000. Frank Baranco is branch manager.

Monroe, La.—The city commissioner has approved a bond issue of $140,000, the proceeds to be used for the construction of an electric light and power plant, and distributing system, in conjunction with the municipal waterworks.

St. Joseph, La.—The town council has plans under way for the installation of a municipal electric lighting plant to cost about $20,000. Bonds for this amount will be voted.

San Antonio, Tex.—The San Antonio Public Service Co. has filed notice of increase in capital from $4,700,000 to $7,000,000 for proposed expansion. Plans are under way for extensions and improvements in the local power plant to cost about $250,000, including the installation of new machinery. The present building will be remodeled.

WESTERN STATES.

Havre, Mont.—The city has recently passed a resolution for the erection of arc lights near the city limits.

Missoula, Mont.—Frank Fawcett is preparing plans for the Flathead Valley Electric Co., Spokane, Wash., of which S. M. Shields is president, for the construction of a dam and the installation of machinery, for a power site on the Flathead river.

Seligman, Ariz.—Development on the Colorado river, Mojave county, is being planned and E. L. Beyard has made application for permission. The plans of the corporation include the building of eight dams in the section, and the installation of equipment that would make possible the development of 480,000 hp. and supply electricity to the Atchison, Topeka and Santa Fe railway for 500 miles of its system, and the irrigation of 500,000 acres of desert land.

Centralia, Wash.—Glen Norman, superintendent of the city lighting department recently went to Hoquiam to inspect the lighting system, with a view of installing such a system in this city.

Oroville, Cal.—Plans for the building of an impounding dam for the old Concow reservoir are being made by the Thermolito colony and the proposed Table Mountain Irrigation district. The Pacific Gas & Electric Co. will share the cost of building the dam.

Wrangell, Alaska.—The Wrangell Mining, Pulp & Power Co. has been incorporated to supply electricity for mining purposes. The capital stock is $1,000,000, those interested being Donald Sinclair and William D. Grant.

INCORPORATIONS.

Philadelphia, Pa.—Broad Manufacturing & Supply Co. To manufacture electrical equipment, etc. Incorporators: Frank A. Moorshead, Commonwealth building.

Boston, Mass.—Electrical Installation Co. Capital, $10,000. To operate an electrical contracting business. Incorporators: William L. Burt, F. J. Hopkins and John C. Smith, 1480 Commonwealth avenue.

Buffalo, N. Y.—Smith-Levee Electric Corp. Capital, $100,000. To operate as electrical contractors. Incorporators: C. and C. A. Smith, and L. E. Levee.

East Orange, N. J.—Wright Electric Co. To conduct a local electrical contracting business. Incorporators: Amos J. Wright, 311 Amherst street, and others.

New York, N. Y.—Marvel Electric Lamp Corp. Capital, $10,000. To manufacture electric lamps. Incorporators: W. H. Menaker, D. H. Lehman and B. Waxenberg, 291 Broadway.

New York, N. Y.—Walter R. Monteser & Co .Capital, $25,000. To engage as electrical contractors. Incorporators: P. and W. Bernstein, W. R. Monteser, 1382 Shakespeare avenue.

New York, N. Y.—Nor-Dan Electrical Supply Co. Capital, $100,000. To manufacture storage batteries and other electrical products. Incorporators: L. C. Naughton, N. C. Degnon and F. C. MacDonald, 161 East 93d street.

New Rochelle, N. Y.—Levene Electrical Supply Co. Capital, $20,000. To manufacture electrical specialties. Incorporators: P. E. Mulligan, S. and R. A. Levene.

PROPOSAL.

Tacoma, Wash.—Bids will be received Jan. 18 by Commissioner of Light & Water, 402 City hall, for furnishing district transformers of 15, 25, 37.5, 50 and 100 kv-a., capacity of 2200 primary voltage, and 220/110 secondary voltage. Also for furnishing $25,000 worth of transformers during the year 1921.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

New Issue of Detroit Edison Co. Gold Bonds.

Spencer, Trask & Co., Chicago, Coffin & Burr, Inc., New York City, Security Trust Co. and First National Co., Detroit, are offering a new issue of The Detroit Edison Co. ten-year 8% convertible debenture gold bonds, dated Jan. 10, 1921, and due Jan. 10, 1931, to yield 8%. The Detroit Edison Co. incorporated in 1903, does the entire commercial electric lighting and industrial power business in the city of Detroit, and also serves various cities, villages and townships tributary to Detroit, the combined population of the territory served being estimated to exceed 1,379,000.

Utah Securities Corp.

For the twelve months to Nov. 30 (subsidiary companies), gross was $8,453,325, increase $1,202,216; net earnings, $4,018,087; increase $274,976. For November gross was $843,500, increase $131,879; net earnings, $438,841, increase $90,693.

Adirondack Power & Light Corp.

	1920.	1919.
October gross	$ 424,725	$ 356,195
Net after taxes	81,805	153,290
Deficit after charges.	7,969	*98,857

*Surplus.

Note—Operating expenses include 12½% of gas and electric revenue to cover maintenance charges and credits for renewals and replacements.

United Gas & Electric Co.'s Subsidiary.

	1920.	1919.
November gross	$1,141,305	$ 979,730
Net after taxes	347,909	376,297
Total income	349,347	378,229
Surplus after fixed charges	188,175	223,580
Twelve months' gross	12,267,563	10,261,072
Net after taxes	3,896,873	3,568,613
Total income	3,944,393	3,600,890
Surplus after fixed charges	2,041,996	1,767,527

United Light & Railways Co.

The holding company and subsidiary companies report for twelve months ended Nov. 30, 1920:

		Increase.
Gross earnings	$11,868,576	$1,732,378
Balance available for United Light & Railways dividends	1,492,919	365,487
Surplus after preferred dividends	886,971	364,843

Dayton Power & Light Co.

	1920.	1919.
Nov. gross earnings	$360,309	$297,593
Operating expenses (including depreciation and taxes)	286,029	184,140
Net earnings	$ 74,280	$113,453
Non-operating revenue	1,276	2,891
Total income	$ 75,556	$116,344
Interest on bonds	$ 34,905	$ 32,113
Other deductions (including other interest and sinking fund)	10,771	57,611
Total deductions	$ 45,676	$ 89,724
Net income	$ 29,880	$ 26,620
Dividends on preferred stock	17,640	16,616
Surplus	$ 12,240	$ 10,004

General Gas & Electric Co. Subsidiary.

	1920.	1919.
November gross	$1,076,693	$ 843,926
Net after taxes	239,764	247,530
Twelve months' gross	11,167,969	8,997,567
Net after taxes	2,375,255	2,646,377

Standard Gas & Electric Co. Subsidiaries.

	1920.	Increase.
Gross earnings	$31,836,368	$5,029,244
Net earnings	11,104,266	1,257,870

Republic Railway & Light Co. and Subsidiaries.

	1920.	1919.
November gross	$ 743,762	$ 577,312
Net after taxes	164,002	178,684
Total income	189,723	182,651
Surplus after charges	25,616	67,973
Twelve months' gross	8,185,414	6,132,913
Net after taxes	1,786,704	1,557,628
Total income	2,006,615	1,826,058
Surplus after charges	503,661	460,469

Portland Railway, Light & Power Co.

	1920.	1919.
November gross	$ 856,586	$ 739,971
Net after taxes	294,087	240,186
Surplus after charges	107,234	56,007
Twelve months' gross	9,399,960	8,583,440
Net after taxes	2,943,053	2,921,880
Surplus after charges	670,554	653,718

Utah Power & Light Co.

	1920.	1919.
November gross	$ 690,992	$ 519,577
Net after taxes	362,507	260,217
Total income	376,689	271,459
Surplus after charges	231,408	135,017
Twelve months' gross	6,604,135	5,625,412
Net after taxes	3,055,197	2,821,005
Total income	3,202,145	2,967,095
Surplus after charges	1,505,329	1,262,911
Balance after preferred dividends	913,829	705,103

Virginia Railway & Power Co.

	1920.	1919.
November gross	$ 989,079	$ 824,995
Net after taxes	249,254	310,547
Total income	259,756	325,296
Surplus after charges	69,596	88,108
Five months' gross	4,734,009	3,929,502
Net after taxes	1,187,980	1,524,390
Total income	1,252,377	1,597,302
Surplus after charges	285,623	437,385

Associated Gas & Electric Co.

	1920.	1919.
November gross	$ 144,774	$ 118,756
Net after taxes	38,095	38,245
Total income	38,116	38,256
Surplus after charges	17,826	18,467
Twelve months' gross	1,398,167	1,229,396
Net after taxes	350,018	313,767
Total income	350,593	314,499
Surplus after charges	122,821	85,992

Blackstone Valley Gas & Electric Co.

	1920.	1919.
November gross	$ 305,157	$ 248,073
Net earnings	86,264	71,566
Surplus after charges	63,265	50,765
Twelve months' gross	3,238,278	2,619,758
Net earnings	807,070	596,976
Surplus after charges	551,644	350,238

Galveston-Houston Electric Co.

	1920.	1919.
November gross	$ 334,583	$ 261,090
Net earnings	100,447	63,011
Surplus after charges	65,151	27,857
Twelve months' gross	3,743,987	3,074,267
Net earnings	1,100,764	819,327
Surplus after charges	678,573	409,956

Duquesne Light Co. and Subsidiaries.

	1920.	1919.
November gross	$1,418,061	$1,033,651
Net after taxes	431,821	344,626
Eleven months' gross	13,618,588	10,718,404
Net after taxes	3,987,160	3,753,058

Dividends.

	Term.	Rate.	Payable.
Am. Lt. & Tract. com.	Stk.	1%	Feb. 1
Am. Lt. & Tract, com...	Q	1%	Feb. 1
Am. Lt. & Tract. pf.....	Q	1.5%	Feb. 1
Common Edison	Q	2%	Feb. 1
Cities Service B.....	Mo.	34c	Feb. 1
Edison E. Ill. (Brockton)	Q	$2.50	Feb. 1
Ill. North. Util. pf.....	Q	1.5%	Feb. 1
Lowell Elec. Lt.....	Q	$2.50	Feb. 1
Mil. El. Ry. & Lt. pf....	Q	1.5%	Jan. 31
Mtn. States Pr. pf.....	..	1.75%	Jan. 25
Pub. Serv. N. Ill. com...	Q	1.75%	Feb. 1
Pub. Serv. N. Ill. pf....	Q	1.50%	Feb. 1

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Jan. 4.	Bid Jan. 11.
Adirondack Electric Power of Glens Falls, common	6	11	12
Adirondack Electric Power of Glens Falls, preferred	6	71	71
American Gas & Electric of New York, common	..	93	95
American Gas & Electric of New York, preferred	6	31	33
American Light & Traction of New York, common	..	68	82
American Light & Traction of New York, preferred	6	67	71
American Power & Light of New York, common	4	41	42
American Power & Light of New York, preferred	6	59	61
American Public Utilities of Grand Rapids, common	..	7	7
American Public Utilities of Grand Rapids, preferred	7	15	17
American Telephone & Telegraph of New York	..	98	100
American Water Works & Elec. of New York, common	..	¾	1
American Water Works & Elec. of New York, particip	7	4½	4½
American Water Works & Elec. of New York, 1st preferred	..	36	37
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	17	18
Cities Service of New York, common	+extra	232	237
Cities Service of New York, preferred	6	62	64
Commonwealth Edison of Chicago	8	102	103
Comm. Power, Railway & Light of Jackson, common	..	10	13
Comm. Power, Railway & Light of Jackson, preferred	6	29	36
Federal Light & Traction of New York, common	..	5	6
Federal Light & Traction of New York, preferred	..	43	45
Northern States Power of Chicago, common	..	34	35
Northern States Power of Chicago, preferred	ex.div.7	76	77
Pacific Gas & Electric of San Francisco, common	..	47	48
Public Service of Northern Illinois, Chicago, common	7	58	57
Public Service of Northern Illinois, Chicago, preferred	6	76	75
Standard Gas & Electric of Chicago, common	..	10	12
Standard Gas & Electric of Chicago, preferred	8	30	32
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	1½	1½
Western Power of San Francisco, common	..	20	21
Western Union Telegraph of New York	extra	77	78
Industrials—			
Electric Storage Battery of Philadelphia, common	4	99	98
General Electric of Schenectady	8	118	117
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42	42